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# BULLETIN

OF

# THE JOHNS HOPKINS HOSPITAL

Entered as Second-Class Matter at the Baltimore, Maryland, Postoffice.

Vol. XXIII.—No. 262.] BALTIMORE, DECEMBER, 1912. [Price, 25 Cents


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## THE BENCE-JONES PROTEINURIA IN CONDITIONS OTHER THAN MYELOMATOSIS: AN INSTANCE ASSOCIATED WITH METASTATIC CARCINOMA.*


By T. R. Boggs, M. D., and C. G. Guthrie, M. D.

*(From the Clinical Laboratory of The Johns Hopkins University and Hospital.)*


Since Kahler[1] first pointed out the association of Bence-Jones proteinuria with multiple myeloma, his observations have been substantiated by numerous reports. This relation holds in the great majority of instances of the disease, but is not constant. Not all cases of myelomatosis exhibit this peculiar body in the urine, for, disregarding such as were recognized only at autopsy and all in which the urine was insufficiently studied during life, there remains a considerable number of careful observations in which no trace of this protein was found after repeated and long continued search, (Parkes Weber[2]; v. Jaksch,[3] 3 cases—one over a period of 2½ to 3 years; Scheele and Herxheimer[4]; Collins[5]).

The intermittent excretion of Bence-Jones protein in this disease has been commented upon by a number of authors, while Kühne,[6] Conti,[7] and Anders and Boston[8] have reported cases in which the peculiar body disappeared from the urine some weeks or months before death.

Again, the Bence-Jones protein has been found in conditions other than multiple myeloma. Such cases are rare and require close scrutiny as not a few of the reported instances are open to doubt with regard to the accuracy of the determination of the protein or the correct interpretation of the pathological findings. Until recently, the Bence-Jones body, now known to be a true protein, was described as an albumose and much confusion has arisen from the fact that traces of albumose have been found in many febrile and cachectic conditions. Some observers through insufficient attention to the reactions differentiating albumose from Bence-Jones protein have failed to distinguish them correctly. In the cases from the literature appended below, special mention will be made of any in which the urinary findings were insufficiently detailed to assure the identification of the Bence-Jones body. From the pathological standpoint there has also been confusion regarding the nature of the bony changes. Taking into consideration these two sources of error, chemical and pathological, we have collected from the literature such cases as seemed to be clearly defined from both standpoints.

The earlier cases of multiple myeloma associated with this unusual body in the urine were described as osteo-malacia (Bence-Jones, Macintire and Dalrymple[9]; Stokvis and Kühne[l.c.]). Jochmann and Schumm[10] originally reported a case of Bence-Jones proteinuria with autopsy as osteomalacia but after Bradshaw's[11] criticism, it was republished as one of multiple myeloma. Raschkes,[12] however, has described an instance of Bence-Jones proteinuria, in which apparently the post mortem examination revealed a true senile osteomalacia. Seegelken's[13] case of chondrosarcoma would probably now be classed as multiple myeloma. Campbell-Horsfall[14] observed a transient excretion of the Bence-Jones body lasting a few days, as a result of a gunshot wound in the leg. Fitz[15]

*Read at a meeting of the Philadelphia County Medical Society, October 23, 1912.

detected this body in the urine of a patient with myxœdema in whom no bone changes were observed, but at no post mortem examination was made, the possibility of some involvement of the marrow cannot be excluded. References to a similar case reported by v. Jaksch[16] seem to be erroneous as the original article mentions only a nephritic albuminuria. We have found in the literature three undoubted cases in association with lymphatic leukæmia (Askanazy[17]; Decastello,[18] 2 cases). In this class also belongs the case which Weinberger[19] reported as chloroma, if we accept his unsupported statement that the Bence-Jones body was present.

Again, this protein has been found associated with metastatic involvement of the bones from a primary tumor situated elsewhere. Oerum[20] described such a finding in a patient with carcinoma of the stomach and multiple metastases to the bones. The patient was 39, a laborer, who had suffered for six months with diarrhœa; later he developed pains in the bones of the shoulder, pelvis and legs; paræsthesias and flimmer scotoma; loss of weight; and symptoms of gastric stenosis. In the urine Bence-Jones protein was found in small quantities, 0.25-0.5 gm. per litre on several examinations, but gradually diminishing in amount before death, which occurred seven months after the onset of symptoms. No other protein was present. The autopsy showed typical metastases from the gastric carcinoma, widely disseminated in the bones. So far as we have been able to ascertain, this is the only well established instance of the kind hitherto recorded.

Others have reported cases possibly referable to metastatic foci in the bones, but not substantiated by autopsy; Boston,[21] in a woman, who developed a characteristic proteinuria with bone symptoms, four years after the removal of a cancer of the breast; Martin,[22] in a woman before and after operation for ovarian neoplasm; Hirschfeld[23] in a man with abdominal tumor. The two latter authors make the statement that the Bence-Jones body was found but give no details as to the methods employed for its detection.

The foregoing cases, with our own which follows, have an important bearing upon the theoretical consideration of the relation of Bence-Jones proteinuria to multiple myeloma.

Case History *: E. B., white female, 37. Admitted to The Johns Hopkins Hospital April 22, 1912. Died May 9, 1912.

*Complaint.*—Rheumatism.

*Family History.*—Father supposed to have died of cancer.

*Past History.*—Unimportant.

*Present Illness.*—Began six months before admission with onset of sudden pain in the right hip, which increased so that she was obliged to stop work two weeks later; great difficulty in walking. After two months, a similar trouble appeared in the left hip. Coincident with the joint trouble, she noticed increasing nervousness, numbness of the hands and awkwardness. Appetite poor. Occasional vomiting unassociated with pain. Loss of 40 pounds in weight. Four weeks ago she noticed a painful lump in the right breast. The discovery of this lump was not elicited in taking the history but during a physical examination.

*Physical Examination.*—Patient much emaciated. Slight general pigmentation, most marked in folds of the skin. *Lungs* clear. *Heart* normal. Hard, irregular mass in right *breast* with retraction of the nipple and some puckering of the skin. *Abdomen* normal. *Reflexes* normal. No local or general *glandular* enlargement. *Bones:* Spine somewhat stiff. Some shortening of right leg. Tender node on sixth rib—right side—below breast. *Blood pressure:* 140 mm. Hg. *Blood:* Red blood cells: 4,000,000; white blood cells: 9,200; Hb. 74%. Differential count: normal. Wassermann: negative.

An extensive *radiographic* study by Dr. Baetjer was reported as follows: "X-ray examination shows carcinomatous metastases in skull, ribs, both trochanters, both ilia, and right tibia. These foci are slightly different from ordinary metastases in that the areas involved in the bones are sharply limited and do not seem to be invasive in character. The metastatic areas in the bone at first glance present an appearance, somewhat like giant cell sarcoma, as there is definite new bone formation around the edge, as though an attempt had been made to limit the disease."

*Urine.*—Acid, clear, 1012 to 1018. No sugar. No casts. No red or white blood cells. Occult blood test (guaiac)—negative. Layer test with $HNO_3$ gave an immediate well defined white ring at the point of contact. With cold acetic acid there was no precipitate. With heat and acetic acid, there was a precipitate at 60° C.—partial clearing on boiling—reprecipitation on cooling. The filtrate from this reaction gave no test for protein (Biuret). The washed precipitate obtained by heating to 60° C. was soluble in warm dilute $Na_2CO_3$ and remained in solution after dialysis; then giving the characteristic reactions for Bence-Jones protein in the pure state. On the addition of one drop of 25% $HNO_3$ to a few cubic centimeters of the urine in a test tube there was an initial turbidity which cleared up on shaking. The addition of a few more drops of acid caused a precipitate in the cold—almost completely soluble on boiling—and reprecipitated on cooling. With two volumes of saturated ammonium sulphate solution there was complete precipitation—with resolution on dialysis. Total amounts of urine were studied for nine days—up to 48 hours before death. Incontinence for last two days—no urine collected. In this study it appeared that on days 1 to 4 inclusive, and on the 7th day, Bence-Jones protein alone was present in the urine, while on the 5th and 6th days, traces of serum albumin were discovered in addition to the Bence-Jones protein. On the 8th day Bence-Jones reaction was doubtful and serum albumin was present, while on the 9th day, no Bence-Jones body was detected but serum albumin was found. On these two days the urine was strongly alkaline and somewhat putrid. The total protein varied between 0.25 and 1.25 gms. per litre (Tsuchiya). From the combined urines of five days the Bence-Jones protein was isolated by precipitation with two volumes of saturated ammonium sulphate solution and dialysed until chlorine-free, the process being repeated three or four times, when a clear neutral, slightly amber colored fluid was obtained which gave all the characteristic reactions for Bence-Jones protein in the pure state. Owing to the accidental loss of our material we were unable to complete an elementary analysis.

During the short period of observation, spontaneous precipitation of the protein did not occur.

Careful renal functional tests were made by Drs. Fitz and Rowntree. These showed a phenolsulphonephthalein excretion of 23% for two hours: lactose 8%; iodide present after 72 hours; total chlorides, 0.15-0.18% of the amount ingested.

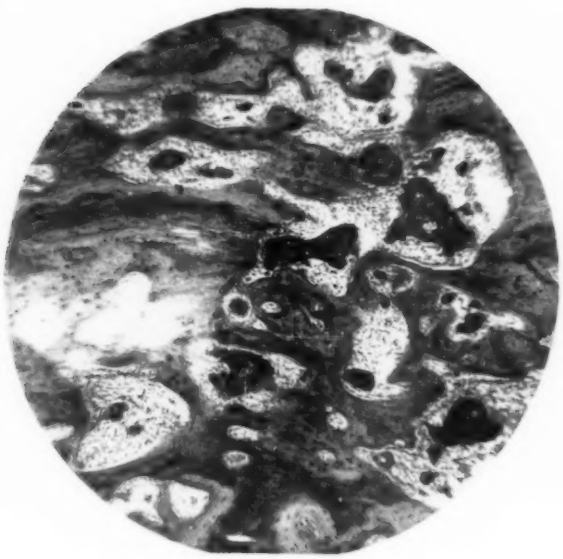
The patient became rapidly weaker and semicomatose, with loss of sphincter control, difficulty in swallowing, and feeble, irregular heart, death occurring on May 9th.

No autopsy was secured, but a portion of the femur was removed for histological examination. For the following report on this we are indebted to Dr. Joseph C. Bloodgood.

Pathological Diagnosis.

*Section I. Bone and Tumor.*—Epithelial cells of the glandular type in alveoli of different sizes and shapes, surrounded by a

* This case was reported briefly by the authors in a previous communication. Trans. Assoc. Am. Phys., 1912.



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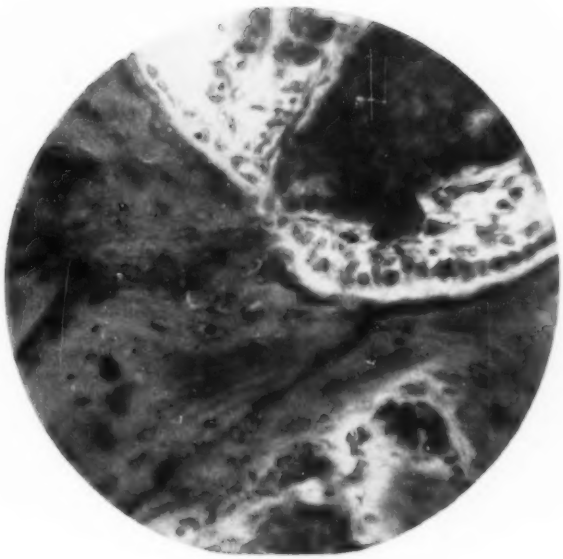

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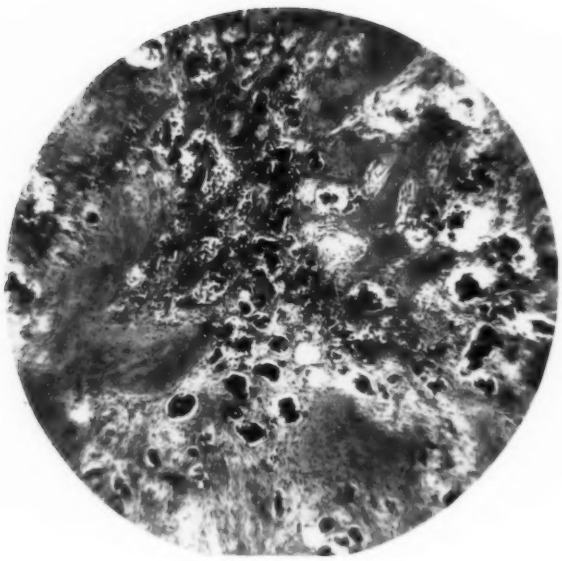

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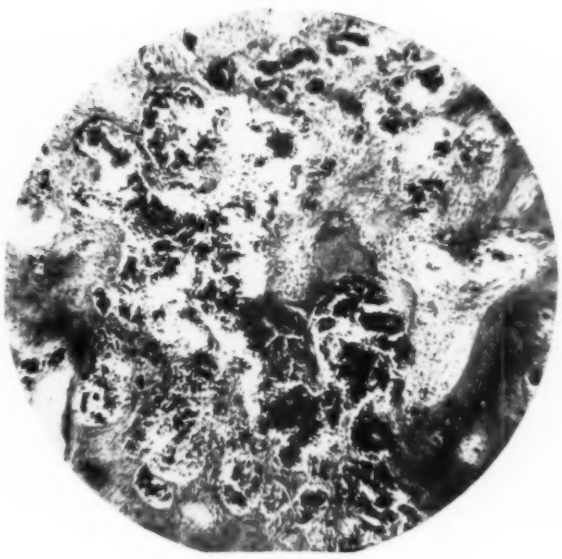

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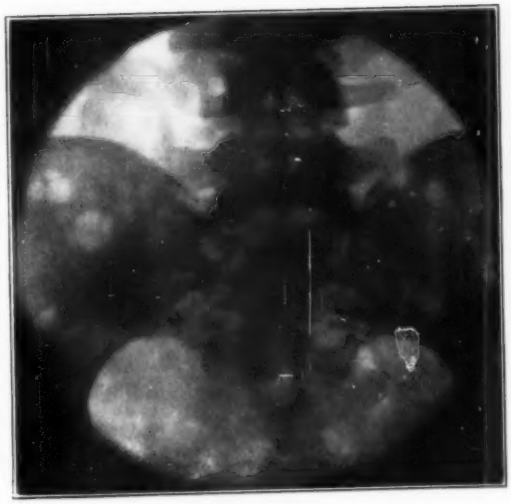
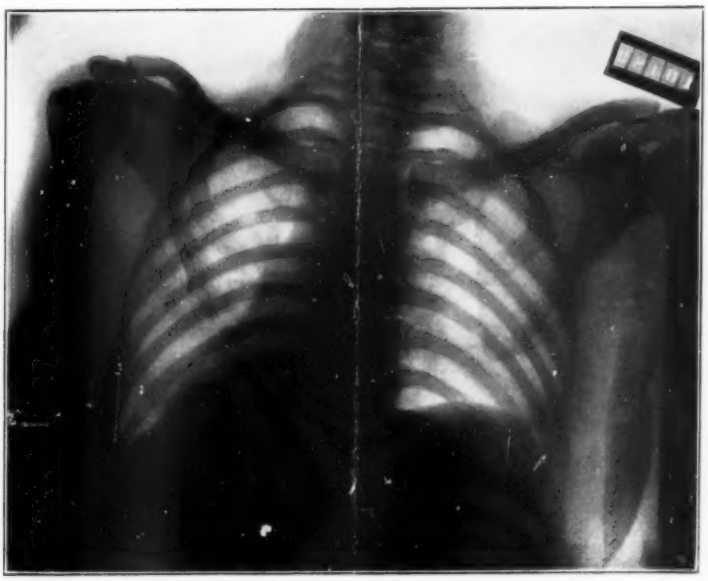
TUMOR AND BONE FROM FEMUR.

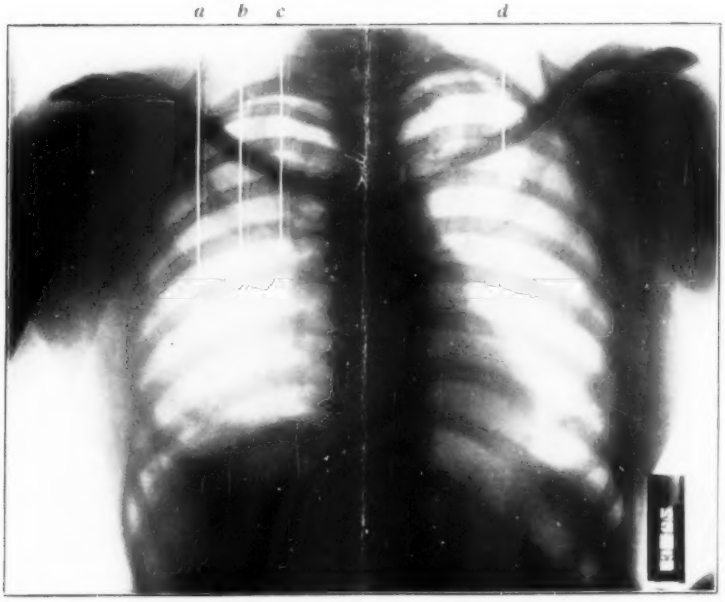
Section I. 1 and 2, low and high magnification.
Section II. 3 and 4, low and high magnification.



Metastatic Nodules in Skull, Pelvis and Long Bones.



METASTATIC NODULES IN THE RIBS.




ANTERIOR VIEW OF THORAX.

*a*, *b*, *c*, *d*, metastatic nodes in the ribs.

rather dense fibrous stroma. In this stroma there are two types of bone areas: old bone showing lacunar absorption by the cancer cells and typical islands of new bone formation of the endosteal cell type. This was first described by von Recklinghausen as osteitis carcinomatosa.

*Section II. Bone and Tumor.*—Shows in addition, medullary fat tissue, normal cancellous bone, with islands of cartilage formation, cancer infiltrating and absorbing cancellous bone, fewer areas of new bone formation.

In the case here reported there can be no doubt of the nature of the pathological process and the presence of the Bence-Jones body in the urine was clearly demonstrated, making the second authenticated instance of the sort on record.

In collating the foregoing material we are struck by the fact that all the cases of Bence-Jones proteinuria have one point in common—namely, the more or less extensive involvement of the bone marrow, Fitz's case excepted, in which no examination of the bone marrow was made. It is also obvious that the relation of multiple myeloma to Bence-Jones proteinuria cannot be specific, for we see that other disease processes involving the marrow may lead to the excretion of this unusual body. The excretion of the protein seems also to bear no fixed relation to the extent or duration of the disease process, as it may appear in the urine before any demonstrable bone lesions occur (Boggs & Guthrie[26] have reported a case without bone symptoms and with normal skiagrams), and may disappear at a time when the lesions in the marrow are most extensive. Again very wide spread involvement of the bone marrow may occur unassociated with this type of proteinuria. In illustration of this point the following table is appended:

DIVERSE BONE INVOLVEMENT WITHOUT BENCE-JONES PROTEINURIA.

| Cases. | Diagnosis. | No. |
|---|---|---|
| Parkes Weber[2] | Multiple myeloma | 1 |
| v. Jaksch[3] | Multiple myeloma | 3 |
| Scheele & Herxheimer[4] | Multiple myeloma | 1 |
| Collins[5] | Multiple myeloma | 1 |
| Stokvis—cited by Kühne[6] | Multiple osteosarcoma | 1 |
| Markwald[24] | Intravascular endothelioma, practically all bones of body involved. | 1 |
| Naunyn[25] | Carcinomatous metastases to bone,—multiple. | 1+ |
| Askanazy[17] | Lymphatic leukaemia | 1 |
| Decastello[13] | Acute lymphatic leukaemia | 1 |
| Decastello[18] | Chronic lymphatic leukaemia | 7 |
| Decastello[18] | Chronic myeloid leukaemia | 13 |
| Author's | Osteosarcoma,—single | 5 |
| Author's | Osteosarcoma,—multiple | 1 |
| Author's | Lymphosarcoma, multiple bone metastases | 2 |
| Author's | Melanotic sarcoma | 1 |
| Author's | Carcinoma breast, metastases to bone | 4 |
| Author's | Multiple enchondromata | 2 |
| Author's | Osteomyelitis | 3 |
| Author's | Osteomyelitis and periostitis,—luetic | 1 |
| Author's | Epiphysitis | 1 |
| Author's | Pyarthrosis,—knee | 1 |
| Author's | Arthritis,—knee, tuberculous | 1 |
| Author's | Rachitis | 1 |
| Author's | Osteitis deformans | 1 |
| Author's | Fracture | 2 |
| Author's | Acute lymphatic leukaemia | 2 |
| Author's | Chronic lymphatic leukaemia | 1 |
| Author's | Pernicious anaemia | 3 |
| Author's | Lead poisoning | 1 |
| Author's | Chronic myeloid leukaemia | 1 |
| | | 65+ |

A brief scrutiny of this table makes it apparent that extensive bone and bone marrow disease may exist unassociated with Bence-Jones proteinuria.

If we may assume from qualitative tests alone that the protein found in our own and the other cases collected, is identical with that excreted in myelomatosis, then any possibility of the Bence-Jones body being a specific derivative of a specific pathological process must be abandoned. In fact, the evidence at hand points strongly to the origin of this body, as a product of endogenous metabolism, rather than directly from the diseased tissue.

Notwithstanding the paradoxical incidence of Bence-Jones proteinuria in bone marrow disease, we cannot avoid the conclusion that the marrow is in some way concerned in its production. So far, there is very little experimental evidence bearing on this point. From certain digestion experiments Rosenbloom[27] draws the conclusion that Bence-Jones protein may be derived from osseoalbumoid (Hawk and Gies[28]). Zülzer[29] has shown that in dogs, repeated injections of pyrodin may produce a severe, "pernicious" anemia with hyperplasia of the bone marrow and the excretion of Bence-Jones protein in the urine. Again, as has been shown by Selling[30] the injection of benzol in rabbits induces a severe anemia with aplasia of the bone marrow. We have examined the urine of six such rabbits over four to eight consecutive days without finding a trace of the Bence-Jones body.

While the metabolic studies are not wholly in accord, the more careful and extended observations seem to indicate that the excretion of this body is largely independent of the amount and kind of protein ingested. There is much to commend the suggestion of Hopkins and Savoy[31] that Bence-Jones proteinuria be viewed as an intermediary metabolic anomaly analogous to cystinuria and alkaptonuria, but occurring at a higher level. "This interruption might be due either to the positive influence of a toxin from the growth or to the loss of some normal function of the bone marrow." There is nothing in the postulate essentially incompatible with the diversity of pathological conditions associated with the excretion of this protein. It is possible that the bone marrow has some function in connection with the endogenous metabolism of proteins, which may be disturbed by any one of a variety of disease processes.

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# FURTHER OBSERVATIONS ON THE CARCINOMA SKIN REACTION.*

By Hans Lisser, M. D., and Arthur Bloomfield, M. D.,
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In 1910 Elsberg, Neuhof and Geist[1] proposed a skin reaction for carcinoma, which consisted in the subcutaneous injection into the forearm of 5 minims of a 20 per cent suspension, in normal salt solution, of washed human red blood corpuscles, obtained from a normal, healthy individual. Their work comprised 684 injections in 432 patients, and an analysis of their cases shows a characteristic reaction in 89.9 per cent of the cases suffering from carcinoma, and no reaction in 94.3 per cent of non-malignant cases.

Moss,[2] following the work of Landsteiner, was able to show that every human being will fall into one of four isoagglutinin and isohemolysin groups, and that this grouping is established shortly after birth, and does not vary through life, in health or in disease.

This suggested the possibility that there was a relation between the skin reaction above described and the presence of normal isohemolysins. Were such the case, the value of the test from a specific diagnostic standpoint would be nil. In order to test this point, Gorham and Lisser[3] made a determination of the grouping of a large number of patients, and injected each patient with red blood cells belonging to each of the four agglutinin groups. Thus a ready comparison could be made between the reaction in *vivo* and in *vitro*.

Although their results indicated that apparently no connection existed between a positive skin reaction and hemolysis in the test tube, yet they determined the significant fact, that the grouping of the corpuscles employed for the injection is not a matter of indifference, but one of essential importance, since positive reactions occasionally occurred with one or two of the corpuscle groups, and not with the others. It was evident then, that the injection of an unknown group of corpuscles might lead to an erroneous deduction. However, there appeared to be one group, namely Group IV, (the corpuscles of which are neither agglutinated nor hemolysed by any sera in *vitro*), which might be utilized for the reaction with reasonable reliability, since in their entire series of 124 cases, in which the four types of corpuscles were injected subcutaneously, not a single instance was observed in which the corpuscles of Group IV gave a positive reaction without the corpuscles of Groups I, II, and III also showing a positive reaction.

Accordingly, in the hope of simplifying the test and shedding further light on its value in the diagnosis of malignant disease, we carried out another series of experiments, using the corpuscles of Group IV alone. This paper reports the results of the method in 62 verified cases of malignant disease (carcinoma and sarcoma) and in 94 cases of healthy individuals or patients suffering from various non-malignant ailments.

## Technique.

The corpuscles used for injection were always obtained from the same individual, a normal healthy person under constant surveillance and definitely known to belong to Group IV. On the day before the tests were to be made, 15 cc. of blood were aseptically removed from a vein of the forearm and immediately introduced into sodium citrate, to prevent clotting. It is important to wash out the syringe with sodium citrate before use, in order to prevent any hemolysis from water left in the syringe after boiling. The corpuscles thus obtained were centrifugalized, the supernatant fluid pipetted off, and the cells washed three times with normal salt solution. A 20 per cent suspension was then made and allowed to remain over night in the ice chest. The next morning this suspension was drawn up into syringes which had been sterilized, and washed out with normal salt solution. The flexor surface of the forearm of the patient to be tested was cleaned with alcohol and ⅓ to ½ cc. of the corpuscle suspension injected subcutaneously. The corpuscles used were never more than twenty four hours old.

* From the Clinics of The Johns Hopkins Hospital.
[1] Am. J. M. Sc., 1910.
[2] Johns Hopkins Hosp. Bull., 1910, XXI, No. 228.
[3] Am. J. M. Sc., 1912, CXLIV, 103.

## TABLE I.

### VERIFIED CASES OF MALIGNANT DISEASES

| No. | Diagnosis | How verified | Reaction | | No. tests | Cured | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Before operation | After operation | | | |
| 1 | Cancer of cervix | Operat'n and microscope. | + | .. | 1 | ? | |
| 2 | Cancer of cervix | Operation | .. | ? | 1 | ? | |
| 3 | Cancer of cervix | Operation | .. | 0 | 1 | Probably cured. | |
| 4 | Cancer of cervix | Operation | + | .. | 1 | ? | |
| 5 | Cancer of cervix | Operation | .. | + | 1 | Not cured. | |
| 6 | Cancer of cervix | Operation | .. | 0 | 1 | Probably cured. | |
| 7 | Cancer of cervix | Operation | 0 | .. | 1 | | |
| 8 | Sarcoma of bladder with metastases. | Operation | .. | + | 1 | Not cured. | |
| 9 | Cancer of bladder | Operation | + | .. | 1 | Not cured. | |
| 10 | Cancer of bladder | Operation | + | 0 | 2 | Probably cured | Positive April 29th, negative May 27th, after radical operation. |
| 11 | Cancer of bladder | Operation | .. | + | 1 | Inoperable. | |
| 12 | Cancer of ovary | Operation | .. | 0 | 1 | Questionable cure. | |
| 13 | Cancer of ovary | Operation | .. | + | 1 | Inoperable. | |
| 14 | Cancer of rectum | Operation | + | .. | 1 | Not cured. | |
| 15 | Cancer of prostate | Operation | .. | + | 1 | Not cured. | |
| 16 | Cancer of prostate | Operation | 0 | .. | 1 | Not cured. | |
| 17 | Cancer of prostate | Operation | + | .. | 1 | Not cured. | |
| 18 | Cancer of prostate | Operation | .. | 0 | 1 | Not cured. | |
| 19 | Cancer of cecum | Operation | .. | 00 | 2 | Probably cured. | |
| 20 | Cancer of hepatic flexure | Operation | + | .. | 1 | Not cured. | |
| 21 | Cancer of pancreas | Autopsy | + | .. | 1 | Dead | Not operated on. |
| 22 | Cancer of pancreas | Operation | .. | 0 | 1 | Inoperable. | |
| 23 | Cancer of stomach | Operation | + | .. | 1 | Inoperable. | |
| 24 | Cancer of stomach | Operation | 0 | .. | 1 | Not cured. | |
| 25 | Cancer of stomach | Autopsy | 0 | .. | 1 | Dead. | |
| 26 | Cancer of stomach | Operation | + | .. | 1 | Inoperable. | |
| 27 | Cancer of stomach | Tissue from gastric lavage | + | .. | 1 | Not cured. | |
| 28 | Cancer of stomach with metastases | Clinically certain | 0 | .. | 1 | Not cured | Not operated on. |
| 29 | Cancer of stomach | Clinically certain | + | .. | 1 | Not cured | Not operated on. |
| 30 | Cancer of stomach | Operation | .. | + | 1 | Inoperable. | |
| 31 | Cancer of stomach | Operation | .. | + | 1 | Not cured | Gastro-enterostomy. |
| 32 | Cancer of stomach | Operation | + | .. | 1 | Not cured | Gastro-enterostomy. |
| 33 | Cancer of tongue | Clinically certain | 0 | .. | 1 | | Not operated on. |
| 34 | Cancer of tongue | Operat'n (no microscope). | .. | 0 | 1 | Possibly cured | Radical operation. Glands showed no cancer. |
| 35 | Cancer of lip | Operation | .. | 0 | 1 | Probably cured | Radical operation two weeks before test. |
| 36 | Cancer of lip | Clinically certain | + | .. | 1 | Not cured. | |
| 37 | Cancer of lip | Clinically certain | 0 | .. | 1 | Not cured. | |
| 38 | Sarcoma of mouth | Operation | .. | + | 1 | Not cured | Partial excision; inoperable. |
| 39 | Cancer of larynx | Laryngoscopic | + | .. | 1 | Not cured. | |
| 40 | Cancer of tonsil | Autopsy | 0 | .. | 1 | Not cured. | |
| 41 | Cancer of jaw | Operation | + | 00 | 3 | Probably cured | Radical operation. |
| 42 | Cancer of face | Operation | + | .. | 1 | Not cured. | |
| 43 | Cancer of face | Operation | 0 | .. | 1 | Not cured. | |
| 44 | Cancer of neck | Operation | 0 | + | 2 | Not cured. | |
| 45 | Cancer of breast (carcinomatosis). | Operation | + | .. | 1 | Not cured. | |
| 46 | Cancer of breast | Operation | .. | 0+ | 2 | Not cured | Recurrence 4 wks. after operation. Second test 5 wks. after operation. |
| 47 | Cancer of breast | Operation | .. | + | 1 | Not cured | |
| 48 | Cancer of breast | Clinically doubtful | + | .. | 1 | | Subsequent history unknown. No operation. |
| 49 | Cancer of breast | Operation | .. | 0 | 1 | Probably cured | Complete operation. |
| 50 | Cancer of breast | Operation | ? | .. | 1 | Probably cured | Complete operation. |
| 51 | Cancer of breast | Operation | + | .. | 1 | Probably cured | Complete operation. |
| 52 | Cancer of breast | Operation | + | .. | 1 | Died on table. | |
| 53 | Peritoneal carcinosis | Operation | 0 | .. | 1 | Inoperable. | |
| 54 | Sarcoma of ribs | Operation | + | 00 | 3 | Possibly cured | No signs of recurrence 2 months after operation. |
| 55 | Cancer of spine | Operation | + | .. | 1 | Not cured | Metastases from breast previously removed. |
| 56 | Cancer of bones | Autopsy | + | .. | 1 | Dead. | |
| 57 | Sarcoma of ilium | Operation | 00 | .. | 2 | Inoperable. | |
| 58 | Sarcomatosis | Autopsy | + | .. | 1 | Not cured. | |
| 59 | Perithelial sarcoma | Operation | 0 | .. | 1 | Not cured. | |
| 60 | Sarcoma of perineum (melanotic). | Operation | 0 | 0 | 2 | Not cured. | |
| 61 | Sarcoma of tibia (metastasis to groin). | Operation | .. | 0 | 1 | Not cured. | |
| 62 | Retroperitoneal tumor | Operation | + | .. | 1 | Not cured. | |

TABLE II.

CASES OF NON-MALIGNANT DISEASE AND NORMAL CONTROLS.

| No. | Diagnosis. | Reaction. | No. tests. | Remarks. |
|---|---|---|---|---|
| 1 | Typhoid fever | 0 | 1 | |
| 2 | Typhoid fever | 0 | 1 | |
| 3 | Typhoid fever | 0 | 1 | |
| 4 | Syphilis of liver | 0 | 1 | |
| 5 | Pernicious anaemia | 0 | 1 | |
| 6 | Pernicious anaemia | 0 | 1 | |
| 7 | Pernicious anaemia | 0 | 1 | |
| 8 | Secondary anaemia | 0 | 1 | |
| 9 | Diabetes mellitus | 0 | 1 | |
| 10 | Myelogenous leukaemia | 0 | 1 | |
| 11 | Myelogenous leukaemia | 0 | 1 | |
| 12 | Enlarged liver | 0 | 1 | Clinical diagnosis cancer of stomach. Exploration showed enlarged liver (luetic). |
| 13 | Enlarged liver | 0 | 1 | Clinically cancer or aneurysm. Explorat'n showed enlarged liver. |
| 14 | Cardiac disease | 0 | 1 | |
| 15 | Cardiac disease | 0 | 1 | |
| 16 | Cardiac disease | 0 | 1 | |
| 17 | Chronic nephritis | 0 | 1 | |
| 18 | Osteoarthritis of hip | 0 | 1 | |
| 19 | Arthritis of hip (tuberculous) | 00 | 2 | |
| 20 | Arthritis of shoulder (pneumococcus). | 0 | 1 | |
| 21 | Infectious arthritis (secondary anaemia). | + | 1 | |
| 22 | Gonorrhoeal arthritis (knee). | 0 | 1 | |
| 23 | Arthritis, sacro-iliac | 0 | 1 | |
| 24 | Osteoarthritis of hip | + | 0 | |
| 25 | Arthritis | 0 | 1 | |
| 26 | Ankylosis of hip | 0 | 1 | |
| 27 | Multiple arthritis | 0 | 1 | |
| 28 | Arthritis | 0 | 1 | |
| 29 | Relaxation of lumbar spine | 0 | 1 | |
| 30 | Spinal cord lesion (paralysis) | 0 | 1 | |
| 31 | Gastric ulcer | 0 | 1 | |
| 32 | Purpura | + | 1 | To be expected. |
| 33 | Gall-stones | + | 1 | Operation. |
| 34 | Gall-stones | 0 | 1 | Clinically thought to be gastric ulcer with early carcinomatous change (operation). |
| 35 | Chronic pancreatitis and cholecystitis. | 0 | 1 | Operation. |
| 36 | Chronic appendicitis | + | 1 | Operation. |
| 37 | Acute appendicitis | 0 | 1 | Operation. |
| 38 | Appendix abscess | 0 | 1 | Operation. |
| 39 | Acute appendicitis | 0 | 1 | Operation. |
| 40 | Chronic appendicitis | 0 | 1 | Operation. |
| 41 | Subacute appendicitis | 0 | 1 | Operation. |
| 42 | Chronic appendicitis | 0 | 1 | Operation. |
| 43 | Intestinal obstruction | 0 | 1 | Operation. |
| 44 | Renal calculus | 0 | 1 | Operation. |
| 45 | Pyonephrosis | 0 | 1 | Operation. Thought to be a hypernephroma. |
| 46 | Hernia | 0 | 1 | |
| 47 | Hernia | 0 | 1 | |
| 48 | Hernia | 0 | 1 | |
| 49 | Hernia | 0 | 1 | |
| 50 | Hernia | 0 | 1 | |
| 51 | Hernia | 0 | 1 | |
| 52 | Hernia | 0 | 1 | |
| 53 | Hernia | 0 | 1 | |
| 54 | Hernia | 0 | 1 | |
| 55 | Hernia | 0 | 1 | |
| 56 | Hernia | 0 | 1 | |
| 57 | Hernia | 0 | 1 | |
| 58 | Hernia | 0 | 1 | |
| 59 | Hernia | 0 | 1 | |
| 60 | Hernia | 0 | 1 | |
| 61 | Hydrocele | 0 | 1 | |
| 62 | Hydrocele | 0 | 1 | |
| 63 | Varicocele | 0 | 1 | |
| 64 | Varicocele | 0 | 1 | |
| 65 | Benign hypertrophy of prostate. | 0 | 1 | Operation. |
| 66 | Benign hypertrophy of prostate. | 0 | 1 | Operation. |
| 67 | Benign hypertrophy of prostate. | 0 | 1 | Operation. |
| 68 | Vesical calculus | 0 | 1 | Operation. |
| 69 | Per rectal abscess | 0 | 1 | |
| 70 | Perirectal abscess | 0 | 1 | |
| 71 | Perirenal abscess | 0 | 1 | |
| 72 | Chronic infection of leg | 0 | 1 | Anaemia and cachexia. |
| 73 | Chronic infection of leg | 0 | 1 | |
| 74 | Carbuncle | 00 | 2 | |
| 75 | Old fracture of tibia | 0 | 1 | |
| 76 | Compound fracture of tibia | 00 | 2 | |
| 77 | Fracture of patella | 0 | 1 | |
| 78 | Fracture of radius | 0 | 1 | |
| 79 | Deformed leg | 0 | 1 | |
| 80 | Club foot | 0 | 1 | |
| 81 | Ulcer of leg (benign) | 0 | 1 | Microscopic examination. |
| 82 | Contusion of arm | 0 | 1 | |
| 83 | Osteomyelitis of clavicle | 0 | 1 | |
| 84 | Burn of arm | +0 | 2 | Positive shortly after being burnt. |
| 85 | Tuberculosis of breast | + | 1 | Clinically and at operation cancer. Microscopically showed tuberculosis. |
| 86 | Mixed tumor of parotid | 0 | 1 | Before operation. |
| 87 | Polypoid endometritis | 0 | 1 | Clinical diagnosis uncertain. |
| 88 | Aneurysm | 0 | 1 | |
| 89 | Aneurysm | 0 | 1 | |
| 90 | Pigmented mole of face | 0 | 1 | |
| 91 | Lipoma of axilla | 0 | 1 | Before operation. |
| 92 | Control | 00000 | 5 | |
| 93 | Control | 0000 | 4 | |
| 94 | Endocervicitis | + | 1 | Operation. |

## REACTION.

When the injection is properly given a small tumor at once appears, which soon subsides, leaving a pin point abrasion where the needle entered. The reaction begins to appear, as a rule, between three and five hours after the injection, gradually increasing in intensity until it has reached its height at the end of six to eight hours. When fully developed, it appears as a somewhat irregular oval area, measuring from $1\times2$ to $3\times5$ cm., with a well-defined margin. The color varies from a brownish red to a maroon, with frequently a bluish to purple tinge. The lesion is distinctly raised from the surrounding skin, slightly boggy on palpation, and often somewhat tender. When the lesion has disappeared, there remains behind a flat, yellowish, or greenish, discoloration, such as is left by any ecchymosis. Negative cases show either the point of needle puncture or a small flat area of varying color. It is advisable to give injections early in the day so that observations by daylight are possible.

### MISLEADING REACTIONS.

1. *The Intradermal Reaction.*—Care should be taken to give the injection under the skin, and not into it. Confusion may occur otherwise, since a peculiar indurated, reddish lesion will usually result. This, however, can be readily distinguished from the true positive test.

2. *The Immediate Reaction.*—In choosing the site for injection, one should be careful to avoid superficial veins. Yet, in spite of exercising this precaution, a few cases will at once show an area of purplish discoloration. This must never be considered a positive reaction—and, usually, the giving of another injection in another location will correct the error. Occasionally, however, even though no tiny vessel has been ruptured, a reaction will occur at once, apparently without explanation.

3. *The Painful Arm.*—In eight cases, there appeared within eight to ten hours a diffuse reddening of the skin about the site of the injection, covering an area of $3\times6$ inches, which became redder in the next twelve hours, reaching a maximum in about twenty-four hours. The arm then was red, hot, tender, and there was considerable pain on motion at the elbow. The symptoms disappeared gradually in the next twenty-four hours, leaving no ill effects. There was no general reaction. Infection seemed to be safely excluded since the great majority of patients injected in precisely the same manner, at the same time, with the same suspension,

showed absolutely no such result. An anaphylactic phenomenon was thought of, but this peculiar picture still remains unaccounted for.

### SUMMARY.

A. VERIFIED CASES OF MALIGNANT DISEASE TESTED BEFORE OPERATION OR AFTER A PALLIATIVE OPERATION.

| | | |
|---|---|---|
| Positive reactions | 37 | 66% |
| Negative reactions | 19 | 34% |
| Total cases | 56 | |

In three of these patients tested as controls, where malignancy had not been suspected, the appearance of a positive skin test was followed in each case by exploration and the disclosure of the presence of cancer.

B. VERIFIED CASES OF MALIGNANT DISEASE TESTED AFTER AN OPERATION SUPPOSED TO BE CURATIVE.

| | | |
|---|---|---|
| Positive reactions | 0 | 0% |
| Negative reactions | 10 | 100% |
| Total cases | 10 | |

With regard to the prognostic significance of the test, it is interesting to note that in the small series of cases (ten) tried after supposedly curative operation, not a single positive reaction occurred. It is important, however, to determine more completely just what indication the test affords of the recurrence of cancer after a radical operation. In one case, for example, (No. 46) there was a negative reaction immediately after a complete excision of a cancer of the breast. A week after the indications of recurrence, which appeared a month after operation, the test was positive.

C. NON-MALIGNANT CASES GIVING POSITIVE REACTIONS.

1. Infectious arthritis with secondary anæmia.
2. Osteoarthritis of hip.
3. Gall stones.
4. Chronic appendicitis.
5. Tuberculosis of breast.
6. Endocervicitis.
7. Burn of arm (in early toxic stage).
8. Purpura.

The last two could be excepted, but even including these, results show

| | | |
|---|---|---|
| Positive reactions | 8 | 8.4% |
| Negative reactions | 86 | 91.6% |
| | 94 | 100.0% |

In considering the specificity of the test, the question naturally arose as to whether the positive reactions were not due to the cachexia and toxæmia coincident with the malignant disease. To settle this point a number of individuals were selected who were in advanced cachexia from chronic infections, or affected with diseases in which presumably blood destruction was going on, such as pernicious anæmia and leukæmia. These cases were all negative.

### CONCLUSIONS.

A summary of the above 158 cases, in which corpuscles of Group IV alone were used show that:

1. In 62 cases of verified malignant disease, two-thirds gave a positive reaction, and one-third were negative.
2. In 94 control cases, 91.6 per cent were negative and 8.4 per cent positive.
3. As a practical diagnostic adjunct, a negative skin test adds little or no weight to the evidence against cancer, being comparable to many other clinical tests of empirical nature.
4. A positive reaction is strong presumptive evidence of cancer.
5. To obtain reliable results, corpuscles of Group IV must be used.

# ON THE CAUSES OF BIRTH.

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One of the most interesting series of problems is that associated with the reproductive function in the female: the relation of ovulation to menstruation; the physiology of implantation; the "selective function" of the fetal membranes and placenta; the embryo metabolism and its influence upon the mother; the causes of birth; the origin of the stimulus for the first respiration; the physiology of the fetal circulation and its relation to the changes at birth; the influence of the internal secretion from the ovary and particularly the function of the corpus luteum; and perhaps along with these the factors in the determination of sex. Preyer[1] was probably the first to take up the study of problems of this character in a systematic way, and Marshall[2] in his recent book on "The Physiology of Reproduction" has brought the greater part of the literature together in an accessible form. It is not the writer's intention to attempt a solution of the causal factors in the parturient act but rather to give some idea of what has been done together with some suggestions as to the unexplored phases in the question.

Hippocrates,[3] some centuries before Christ, realized that some fundamental cause must underlie the birth of the child and dismissed it about as follows: that as the embryo grew, its demand for nourishment became greater than the source of supply could furnish, and finally, driven by hunger, the child pushed its feet against the fundus of the uterus and forced its way into the outer world. This naive explanation was questioned by Galen[4] who first described the uterine contractions and held them responsible for the expulsion of the

child. Galen maintained that the "fetus was retained in utero until sufficiently grown and nourished to take food by the mouth" (after Harvey) and "that uterine contractions plus the additional pressure through the abdominal muscles were responsible for birth" (after Knüpffer). Fabricius,[6] some fifteen centuries later added another suggestion "that the weight of the fetus becomes so great as to exert considerable pressure, and the bulk such that the uterus is unable to retain it, added to which the quantity of excrementitious material is so much increased that it cannot be contained by the membranes" (after Harvey).

Harvey[8] entered a general objection to the hunger and the cooling-off theories of Galen in no uncertain language. He asked the following question: "How does it happen that the fetus continues in the mother's womb after the seventh month? Seeing that when expelled after this epoch, not only does it breathe but without respiration cannot survive one little hour, whilst, as I before stated, if it remain in utero, it lives in health and vigor more than two months without the aid of respiration." This question is the most important one asked in the history of the problem and is worth no little consideration. Harvey went on to show that the "uterine humors were not excrementitious"; that the weight and the bulk of the uterine contents were not causal factors in starting contractions; and that the activity of the child itself did not afford the necessary stimulus. "I should rather attribute the birth of the child to the following reason—that the juices within the amnion, hitherto admirably adapted for nutriment, at that particular period either fail or become contaminated with excrementitious material."

Harvey's essay on parturition, like his description of the fetal circulation, was a result of careful study and not mere speculation. He saw the problem in its wider aspects and brought forth the development of the bird to show that it was not hunger but rather the need of respiration that drove the chick from its shell. Just as Harvey's views have been neglected in the bibliographies on the problem, so the epoch-making discovery of his contemporary, Mayow, has not been seriously considered. Mayow[9a] in his argument on the respiration of the fetus calls attention to the fact that "the embryo in its membranes seems to be nearly in the same case and to breathe in very much the same manner as the chick enclosed in the egg. If, however, the fetus is stripped of its membranes, and contracts the muscles of the chest and the diaphragm, there is now a greater expenditure of nitroaerial particles for muscular effort, and consequently the fetus is under a greater necessity to breathe, since nothing is any longer received to supply the want of respiration." The reader must judge for himself whether or not a knowledge of the oxygen of Priestley (a century later) was essential to a true understanding of what respiration meant.

Some forty years after the publication of Harvey's essay, Mauriceau[7] "re-discovered" the distension theory of Fabricius and clearly disregarded Harvey's excellent objections to the same. The distension theory remained as such until about a century later when Petit and Baudeloque attempted to better it. Petit[8] concluded that the uterus might be considered completely distended when the cervical canal became incorporated in the uterine cavity, and when this room had been taken up, the uterus contracted. This was again somewhat modified by Baudeloque[9] who proposed that the uterus was inherently an organ of contraction and attempted to rid itself of the fetus from the first but was prevented by the cervix. When distension, however, had overcome the cervical rigidity, the muscular contraction became effective. Reil[10] changed the view of Baudeloque and while he regarded the uterus as an inherently contractile organ, considered that the distension overcame the contractile power until an irritant limit was attained when the uterine contractions were initiated.

Naegele[11] in 1812 again modified the view of Baudeloque and Reil by including the hypothesis proposed by Hippocrates that the fetus outgrew its source of supply. He maintained that the connection between the fetus and the mother became progressively less as gestation went on until finally the union was dissolved and the fetus, acting as a foreign body, set up contractions in the uterus. This brought into prominence a theory known as the foreign-body theory in our present literature. Power,[12] Hoffmann,[13] Hayn,[14] and Dubois,[15] saw an importance in an analogy which they declared existed in the function of the pelvic organs and advanced the similar notion that just as the urinary bladder was stimulated to contract so the uterus, following the distension theory, expelled the fetus. Hoffmann went so far as to propose that the ovary represented a gland, the tube a duct, and the uterus a sort of bladder. Carus[16] again brought up the distension theory in 1839 and like Baudeloque and Reil found the uterus to be primarily a contractile organ. He placed the time of birth at the period where the uterine musculature became completely developed.

Mende[17] in 1821 made the excellent suggestion that the causal factor lay outside of the uterus and regarded the stimulus as derived through the tenth menstrual period. While Joerg[18] in 1831 again brought up the foreign-body theory and modified it in a somewhat remarkable way. He considered that distension of the uterus brought about an interference with the abdominal circulation in such a way that the circulation in the uterus itself was hampered, with consequent degeneration of the membranes and dissolution of the connection between mother and child. Litzmann[19] defined the uterus as the organ of birth, and was the first to call attention to the fact that the fetus was sometimes developed in other places—a point of some little importance which was overlooked even by later writers. He believed that the contractions were initiated through the nervous system and looked upon the complete development of the nervous mechanism as a determining factor in the cause of birth. Kilian,[20] Scanzoni,[21] Hohl[22] and Tyler-Smith[23] did not contribute materially to what was known except possibly the latter who, favoring the theory of Mende, regarded parturition as a sort of cumulative menstruation. Kilian leaned toward the foreign-body theory; Scanzoni saw the importance

of pressure upon the sensory terminals of the uterine nerves: and Hohl anticipated the natural selection theory by regarding the complete development of the fetus concomitant with that of the uterine musculature.

Up to the year 1858 practically no experimental work had been done on the problem and the solutions offered were largely matters of conjecture supported in part by clinical evidence. Brown-Sequard [24] was the first to perform experiments and found that the uterine musculature became more irritable as gestation advanced and that overloading the maternal blood with $CO_2$ brought about uterine contractions. That Brown-Sequard was ahead of his times is indicated by the fact that Spiegelberg,[25] Eichstedt,[26] Obernier,[27] and Kehrer [28] published later and based their work on conjecture. Eichstedt suggested that the fetus determined the time of birth by swallowing the amniotic fluid, thereby creating a negative pressure in the uterus. The others did not advance an idea which might be termed original. Reimann [29] suggested the possibility of a nerve center which inhibited the uterine contractions and believed that direct stimulation to the uterus or depression of the inhibiting center might bring about the birth act.

The ten years from 1870-1880 were characterized by actual researches and the names of Friedländer,[30] Simpson,[31] Kundrat and Engelmann,[32] Leopold,[33] and Runge [34] may be mentioned. The last named checked the experiments of Brown-Sequard, while the others were interested primarily in the structure of the placenta. Friedländer discovered evidences of thrombosis in the placental sinuses during the eighth month of gestation and this was substantiated by Leopold who called particular attention to the venous congestion and the signs of extravasation. Simpson claimed a fatty degeneration of the membranes which was substantiated by Kundrat and Engelmann but held inconstant by Leopold. Runge, following the experimental line of work, discovered that while excesses of $CO_2$ stimulated the uterus, withholding O brought about the characteristic tetanic contractions.

In 1881 Hasse,[35] following the idea that an excess of $CO_2$ was responsible for uterine contractions, proposed that the $CO_2$ excess was developed in the placental sinuses by reason of a gradual change in the mechanics of the fetal circulation. He also suggested that an excess of waste products might be held in part responsible. Hasse's suggestion regarding a change in the fetal circulation has not been accepted and as Blumreich [36] pointed out even if there were excesses present in the fetal blood stream it would be difficult to show that they would affect the uterine muscle which has nothing to do with the placental sinuses. Geyl [37] in 1881, influenced by Darwin, saw an importance in natural selection as the determining factor; a matter already hinted at by Hohl in 1855. Boehm [38] later practically agreed with the theory offered by Geyl and believes that it is the most reasonable explanation. Liedke [39] expressed an interest in the effect of urea upon the uterine musculature but whether or not he followed this research the writer has been unable to ascertain.

Minot [40] in 1889 revived the influence of the tenth menstrual cycle proposed by Mende and later by Tyler-Smith. Minot regarded menstruation and parturition as homologous and that parturition is a sort of cumulative menstruation. Keilmann [41] in 1891 again brought up the irritation of the cervix theory and his work was followed by that of Knüpffer.[42] Both of these investigators found a development of a system of ganglion cells in the supravaginal portion of the cervix and agreed that it was a stimulation of these intrinsic ganglia which brought about the birth act. The irritability of the cervix had of course been known for many years and their findings were naturally supported by certain clinical data but as Veit [43] pointed out the supravaginal ganglia would not account for the false labor pains in extrauterine pregnancy.

Blumreich [l. c.] in an excellent review of the question, went into the experimental evidence in some little detail and found that none of the existing theories of the cause of birth were well grounded. He himself leaned strongly toward a mechanical or traumatic cause although he appreciated the weakness of his contention.

The work of the past fifteen years may be arranged into three general classes: the first is an exaggeration of the doctrine of cycles; the second bears on an internal secretory relation; and the third leans toward the theory of immunity.

Beard [44] was the first to call attention in a scientific way to the theory of cycles; the menstrual cycle and its relation to parturition had naturally been proposed before. Beard, however, assumed that the cycle in the ovary in man occupied 23 days+. He also brought forward what he termed "the critical period" in the development and this "critical period" represented a stage in the development where the embryo took on distinct characteristics of the species. In man he computed this "critical period" was to be found at a 46 day+stage in the development or double the ovulation period. The duration of gestation he claimed must be computed in terms of "critical periods" and not of menstrual periods and, therefore, the span of gestation in man was equal to six critical units and not to ten menstrual periods. Beard's hypothesis may be expressed in the following words: "The ovary, with its nervous apparatus, from the moment of puberty to the time when its functions naturally cease, may, indeed, be compared to a clock, wound up at the start, and striking the hours with extreme regularity by the periodic emission of one or more eggs. During pregnancy, the clock does not cease to run; it still strikes the hours but in a muffled fashion so that, if all goes well, the sound is not heard outside of the ovary. And, just as some clocks are so arranged, as to give an indication of the striking period, so the ovary announces the normal advent of birth some little time before the ovulation due soon after the birth period." This explanation, therefore, assumes that the period of gestation must run in cycles predetermined by the cycle of the ovary and curiously enough Beard hit upon a 23 day cycle for the female while Fliess [45] found this to be the cycle in the male.

Like Pythagoras, Fliess found magic in numbers, and developed a *Weltanschauung* in a book that is quite beyond

the writer. According to him all things are governed by cycles; in the male, 23 days; in the female, 28 days; and in hermaphrodite forms, 17 days. It may perhaps be well to regard the work as a personal equation of Fliess' until someone well oriented in metaphysics and mathematics has checked his data. The numbers 7, 11 and 6 seem to do equally well and the strange thing is that Beard claimed the periodic function of the ovary to be in terms of 23 days, not 28 days. Symptoms of this theory of cycles nevertheless seem to exist, and a number of interesting cases are reported by Swoboda.[46]

The second series of theories is that connected with a functional relation between ovary and uterus. Pflüger is credited with being the first to suggest a nerve connection although practically the same thing was advanced by von Rotterau[47] in 1852. Pflüger[48] looked upon menstruation as a sort of cumulative reflex touched off by the periodic congestion of the ovary, and an influence of the ovary on parturition, following the relation of menstruation to pregnancy, is not difficult to conceive. Pflüger's views on the relation of ovulation to menstruation or rather the relation of both of them to a congestion of the ovary were in the main supported by Leopold. Beard[l. c.] in 1897 was the first to point out a possible function for the corpus luteum which he regarded as a follicle modified to suppress ovulation during gestation. Born[49a] in 1900 suggested that the corpus luteum was an organ of internal secretion and the first article on this side of the question is by Fränkl and Cohn[49] in 1901. Much literature has appeared since this time by Fränkl,[50] Marshall,[l. c.] Loeb,[50a] Steinach[51] and others. This internal secretory relation, however, brings up the question of the relation of ovulation to menstruation or a common cause in a third factor. As far as offering an internal secretion of the ovary or a relation between the internal secretion of the ovary and the fetus as a cause of birth, nothing very definite is at hand.

Since 1900 there has been a growing tendency to regard the relation between fetus and mother as a purely biochemical one and this naturally falls outside of the province of the anatomist. Thenen[52] in 1900 proposed a refinement of the Baudeloque theory in that he considered the active agent in inhibiting uterine contraction to be found in a vital principle (*vitaler Reiz*) located in the fetus and its membranes. Veit[53] in a rather exhaustive monograph developed the theory of toxicity of the chorionic villi and their behavior when transported in the maternal blood stream, and this seems to be substantiated by the recent work of Fieux and Mauriac[54] in the demonstration of a specific antibody to the toxic qualities of the villi developed in the mother during the second and third months of gestation but disappearing during the fourth. Similarly Ermys-Roberts[55] proposed an enzymic action of the ovum to account for its implantation. Schaeffer[56] located the inhibitory influence to uterine contractions to be found in the syncytial tissue of the placenta and also suggests the lowering of a resistance in the maternal blood at the time of birth. Healy and Kastle[57] found a hormone in the breast which gives rise to uterine contractions—a chemical relation between breast and uterus, therefore, and not a nervous mechanism. The evidence, in other words, points strongly toward the possibility of the embryo determining its own ripeness in terms of altered metabolism or specific influence which may touch off the uterine contractions. It is, however, well known that uterine contractions may be set in operation from the maternal side but this may be regarded a contributing factor as Goltz's experiments on the dog would indicate.

Moenkhaus[58] showed that hybridization increases the period of development and his experiments on fish seem to indicate that the sperm cell exerts a toxicity on the egg cell and may be responsible for the inhibition noted. Similarly Steinach found undoubted evidences of an antagonism of the internal secretion of the testis and the ovary in an inability to make ovarian grafts "take" in a male animal unless it be castrated. Perhaps this toxicity of the male influence upon the female may sometime be held accountable for the relatively larger number of male abortions.

Little work has been done on the causal factors in the hatching of the chick excepting perhaps the work of Preyer on the interchange of gases and the marked rise in the demand for oxygen just before the respirations set in. Recently Keibel[59] has found an interesting functional adaptation on the part of chick and duckling in a marked hypertrophy of the complexus muscle just before the hatching; the development of this muscle permitting a more effective use of the "egg-tooth." The same lack of any very definite information is found in the literature on the viviparous reptile and fish. In the former as far as we are aware only a gaseous interchange occurs and yet the garter-snake brings forth her young intact in the membranes "when they are sufficiently developed." It is, therefore, not likely that we can solve the question of the causal factors in birth until we have more facts and until the process is understood in lower forms where the relations are relatively simple. The case reported by Chapman[60] is suggestive. On October 16, 1816, a woman gave birth to what Chapman terms a 5-6 months' placenta and membranes and a 3-4 months' enclosed fetus; on December 10, 1816, she gave birth to a full term child! Objections may be made to any one theory or combination of theories proposed and until we can answer the question proposed by Harvey, why the embryo remains in the uterus after the seventh month, we cannot assume that much is known of the causes of birth.

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# MORBIDITY AND MORPHOLOGY.

## A COMPOSITE STUDY OF THE INCIDENCE OF DISEASE AND PHYSICAL FORM IN NEW ORLEANS, LOUISIANA.

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My studies of the Filipinos while I was living in the Philippines from 1907 to 1910 enabled me to classify the natives into three large general groups, depending upon their form of head, face, nose, ears, trunk and extremities. Before leaving the archipelago I associated tuberculosis with one of the groups and kidney diseases with the other two. My studies included more than 500 diseased individuals chiefly in the town of Taytay, about 30 miles from Manila, where a medical and anthropological survey was conducted under the direction of the Bureau of Science of the Philippine Government. More than 100 post mortem examinations were subsequently made at Malecon Morgue and the work done at Taytay on the living was in this way corroborated.[1]

Investigations have been continued from time to time since then in New Orleans at the Charity Hospital and the Touro

[1] The results of these observations may be found in my work (Chapter VII) The Racial Anatomy of the Philippine Islanders, J. B. Lippincott Co., Philadelphia, Pa., 1910. The terms used there, Iberion, Austreloid and Primitive, are here replaced by hyper-onto-morph, meso-onto-morph and hypo-onto-morph, respectively.

Infirmary Dispensary, where more than 1000 individuals have been examined. In addition to this about 100 post mortem examinations were made. My work was accomplished chiefly through the kindness of Dr. Lemann, at the Touro Dispensary, whose clinic I attended during the spring months, March, April and May, of 1911 and 1912. I examined first the general morphology of the patient and later examined the case medically with Dr. Lemann or someone else, the diagnosis being concurred in by at least two physicians.

Only 894 of the 1000 records obtained are utilized in this study because of the absence of essential data in the remainder. Diagnosis was made of 539 diseases among the 490 colored individuals, and 445 diseases among the 404 white individuals. When it is understood that 127 negroes and only 24 whites have constipation and in the majority of these there is no other affection, it is demonstrated that the whites exhibit a slightly greater relative morbidity than the blacks, but in none of these figures are the facts significant.

It may be of interest to note the incidence of diseases and sex. One hundred per cent more men than women have tuberculosis, whereas one hundred per cent more women than men have diseases of the central nervous system. One hundred per cent more men than women have syphilis and accidents are more frequent among men than women. On the other hand there is more anemia and constipation among women than among men. These differences may be incidental to habits, or merely accidental variations, without significance.

The white and colored elements of the hospital population here represented exhibit evidences of morbidity in different directions, as indicated in the following table, in percentages.

TABLE I.

WHITE MORBIDITY PREDOMINANT.

| | Pulmonary Tuberculosis | Nervous System | Digestive System | Arthritis | Emphysema | Anemia |
|---|---|---|---|---|---|---|
| White .. | 19 | 13 | 5 | 5 | 3 | 3 |
| Colored . | 9 | 5 | 2 | 1 | 1 | 0.2 |
| Total ... | 14 | 9 | 4 | 3 | 2 | 2 |

COLORED MORBIDITY PREDOMINANT.

| | Constipation | Venereal | Cardiac and Renal | Pleurisy | Aneurysm | Asthma | Trauma |
|---|---|---|---|---|---|---|---|
| White .... | 5 | 11 | 8 | 1 | 1 | 0.6 | 3 |
| Colored ... | 25 | 23 | 10 | 2 | 2 | 1 | 4 |
| Total .... | 15 | 17 | 9 | 2 | 2 | 1 | 4 |

OTHERS.

| | Acute Infections | Arterio-Sclerosis | Others |
|---|---|---|---|
| White ..... | 10 | 4 | 10 |
| Colored ..... | 10 | 3 | 4 |
| Total ..... | 10 | 4 | 7 |

It is to be seen from this table that the whites have more pulmonary tuberculosis, diseases of the nervous and digestive systems, arthritis, emphysema and anemia, whereas the blacks have more constipation, venereal diseases, diseases of the cardiac and renal systems, pleurisy, aneurysm, asthma and traumatic affections, the two having about an equal share of infectious diseases and arterio-sclerosis. The whites have the most of the remaining diseases.

The differences noted are of interest because of the differences in morphology and cultural conditions of the two peoples. The excess of constipation among the colored people is not necessarily an indication of greater susceptibility on their part, but represents their greater ignorance regarding the value of keeping the bowels open and the use of proper means to secure that effect. Neither can the greater extent of venereal infections among the colored people be attributed to greater susceptibility on their part, because the extent of venereal infections among a people is considered to be due directly to the freedom of sexual intercourse—promiscuity. We may infer, therefore, that greater freedom exists among the negroes than among the whites, which condition is acknowledged to be true by all competent observers. So prevalent is venereal infection among them that the question asked the colored people in taking histories in the New Orleans hospitals is not "Did you ever have" the infection, but "When did you have" it.

There are two significant conditions, however, that indicate structural or physiological differences rather than differences in cultural conditions. These are that the whites have more affections of the lungs, of the nerves and of the alimentary canal, whereas the blacks have more affections of the circulatory and renal systems. These differences may be attributed by some observers to physiological causes and may be due to occupation, habit, or other activities of body or mind. One may say that the heart, arteries, veins and kidneys of the colored people are more susceptible to disease than other parts of the system because of the greater stress of manual labor and the excessive sexual exertion on their part; whereas, the brain, nerves, stomach, intestines and lungs of the white people are more susceptible to disease because of greater mental activity and sedentary occupations. The out-of-door activity of the negroes in laborious occupations involving stress and strain of the connective tissue structures undoubtedly produces a greater number of traumatic cases, may affect the heart and kidneys and possibly induces a relative freedom from tuberculosis. But there are fundamental differences in morphologic structure that may account for these differences in susceptibility of the two peoples, and the differences in structure are based on the two fundamental embryonic tissues, mesothelium and epithelium; the lungs, nervous system and alimentary canal derived from epithelium, the heart, circulatory system and kidneys derived from mesothelium. Certain types regardless of race, color, or cultural conditions may be called mesothelial types, while others equally distinct may be called epithelial types. The mesothelial types are greatly developed in bone, muscle and other connective tissues, whereas the epithelial types are less developed in this way, are more developed in brain, lungs and alimentary canal. Great development of either class of tissue seems to weaken it and make it more liable to disease, therefore the two types may be called *epitheliopath* and *mesotheliapath*. The latter is the meso-onto-morph, the former the hyper-onto-morph. But I am going ahead of my subject.

While in the Philippine Islands, I noticed a difference in

susceptibility after I had segregated the types. This occurred in the following way. All unclaimed bodies in the city of Manila are brought to the morgue connected with the medical department of the University of the Philippines where they may be utilized for anatomical purposes. I selected the thin subjects for dissection for two reasons, because they dissect with greater ease and they take injections better. On examination it was found that they had usually died of pulmonary tuberculosis, their arteries were elastic and free from signs of arterio-sclerosis, and their connective tissues, muscle and bone were poorly developed and fragile. Such subjects were invariably of the hyper-onto-morph form, the epithelial type, the epitheliopath. At that time I associated the type with susceptibility to tuberculosis, but since then I have found that all the epithelial structures seem to be more liable to disease. The meso-onto-morph on the other hand is more liable to diseases of the mesothelial tissues.

One unexpected feature of the two forms is that the hyper-onto-morph has a short intestine, 12 to 15 feet, whereas the meso-onto-morph has a long intestine, 20 to 25 feet. I have frequently amazed my students by predicting the length of the intestine before the body was opened, which I did by previously examining the ears of the individual.

I have devised a system of descriptive morphology and have used it in racial anatomy to differentiate morphologic forms. The most exact anthropologists decree that nothing shall be accepted that is not exactly measured or defined, yet there are certain qualities which can be described more accurately than they can be measured. My work is on the order of zoölogy applied to man and is the method of the naturalist rather than the mathematician.

Man's form may be classified by means of the external ear, physiognomy and body parts in three fundamental physical forms. The three fundamental forms represent stages of evolution in the race as well as degrees of growth in the individual, and I have used the terms: hypo-phylo-morph, meso-phylo-morph and hyper-phylo-morph to designate three stages of the former and the terms hypo-onto-morph, meso-onto-morph and hyper-onto-morph to designate three degrees of the latter.

The hypo-onto-morph is usually small in stature and fat, with short legs and arms, chubby hands and feet, and relatively long trunk, the characteristic form of childhood predominating. The head is round, broad and short, and large in relation to the stature of the individual, the total head height from chin to vertex being 1/6 to 1/7 of the total stature, the normal for the European being about 1/8. The face is ovoid, with small forehead and chin, wide cheeks, and is very broad and short, often dished or depressed about the nose—flattened in front—and the face below the eyes is small compared to the size of the head, as in the infant. The nose is flat, broad and short, with depressed, flattened bridge, upturned tip, and the nostrils open forward rather than downward. The eyes are often narrow slits and the eyelids are "puffed" as if infiltrated. The cheeks appear as if they had chestnuts in them thus completing the infantile appearance. This form is found largely throughout the Orient and is a fundamental Malay or Mongolian type. Modified forms similar to this are found elsewhere, especially among the Africans and not a few among the Europeans.

The meso-onto-morph is of medium size and stockily built. The extremities are relatively long, the feet and hands large and the trunk is short. The head and face are ellipsoid, and large compared to the size of the head. The malar and zygomatic bones are prominent, the nose is massive, long, wide and high, with depressed root, straight bridge and nostrils that open downward and forward. This is the fundamental African form but is also found extensively in Europe where it has undergone modification, and it is not unknown in the Orient.

The hyper-onto-morph is either tall and slender or small and delicate. The trunk and extremities are intermediate in length between those of the other two, and the face is also intermediate in size and pentaganoid or triangular, with broad forehead and small chin. The total head height from chin to vertex is less in this form than in the other two, about 1/8 the total stature, the European artist's ideal. The head is large in proportion to the size of the face below the eyes. The head is long and narrow, and the nose is also long and narrow, with high root and bridge, and the nostrils open downward. The eyes are wide open and close together, in contradistinction to those of the hypo-onto-morph, which are semi-closed and far apart. This is the fundamental European form, although their dispersal through migrations, both historic and prehistoric, has taken them to almost all parts of the earth.

From the phyletic standpoint the European represents the present day product of what was originally the hyper-phylo-morph, although occasional mixtures with the hypo-phylo-morph and the meso-phylo-morph have occurred. The African represents the meso-phylo-morph in the same way, and the Oriental the hypo-phylo-morph, each having mixed to some extent with the other two forms.

The terms hypo-, meso-, and hyper-phylo-morph might have been retained instead of using the terms hypo-, meso-, and hyper-onto-morph but I preferred the latter as more specific and because they refer to individuals rather than peoples. The hyper-onto-morph, etc., is then the living representative individual of what was once the hyper-phylo-morph, etc., and retains the original form to some extent, but may have black skin and kinky hair among the negroes, black skin and straight hair among the East Indians, ruddy skin, blonde hair and blue eyes among the North Europeans and tanned skin, black hair and dark eyes among the South Europeans or Mediterranean peoples. In other words I believe the form to be more fundamental than the pigment or hair structure.

It cannot be denied that forms similar to those described under the three heads hypo-, meso-, and hyper-onto-morph may be due to the effects of individual development, or the environment during one generation, in other words, ontogeny, but in general I believe the three forms are relics of previous phyletic forms. Individuals may also be seen who have one

or more of the characters of one form, but otherwise are of one of the other two forms, and this may be attributed to mixing, but is more apt to be a matter of individual development—ontogeny.

The characteristics heretofore given are those usually described by morphologists, but my classification is based more upon ear form than any other factor. The form of the external ear, or pinna, should be more unchangable than any of the characteristics previously given because it is not so liable to physiological and selective influences, and because it is fundamentally cartilage, which, as the ground work for bone, should be the most stable of tissues.

The human ear may be described as consisting essentially of two parts, the external border, or helix, with its lower end, the lobule; and the central part, or concha, with the tragus and antitragus. The outer border of the concha is also the inner border of the helix and it is called the anthelix. The tragus is the small nodule immediately in front of the ear hole, or external auditory meatus, and the antitragus, which is opposite the tragus, is the lower end of the anthelix. Darwin's tubercle is to be seen on the upper part of the helix on the inside of its overturned margin near the top of the pinna. It represents the tip of the ear which has turned in towards the concha during the growth of the fœtus before birth. The pinna is at first formed flat in the embryo and at the fourth month of intrauterine life there is a tip at the upper outer margin of the helix. At this time the ear of the fœtus resembles that of the monkey, *Macacus rhesus*, with its pointed tip extending upward and backward. Later in the development of the fœtus the ear is reduced in size by the rolling in of the tip and of the entire helix, accompanied by a protrusion of the anthelix system including the tragus and the antitragus. When the adult human ear has attained its full maturity the rim of the helix has rolled inward and forward and the tip becomes Darwin's tubercle.

We may conceive that the first or earliest form of the ear after the fourth month of fœtal life is one in which the helix has rolled in, but the anthelix system, including the rim of the concha, the tragus and antitragus, has not projected far out from the head. In this condition the ear would have the form of a half bowl, and would be semi-trumpet shaped. This is the condition of the hypo-phylo-morph ear. Should the ear continue to develop it would assume the shape found in the hyper-phylo-morph, when the ear is flatter with the anthelix system at times projecting beyond the helix, and the latter turned backward towards the head. The tragus and antitragus would then project, and the lobule would be close to the head. The form of the meso-phylo-morph is somewhat intermediate between the other two, but is a distinct type nevertheless.

The hypo-onto-morph ear is usually small and round, the helix is turned in and forms a heavy roll at the rim of the ear extending downward into the lobule which turns almost horizontally to form a shelf-like lower border to the ear. The anthelix is almost parallel to the helix and is about the same size because the helix has rolled in until it has almost covered the anthelix, the two looking like a double roll surrounding the concha. The latter is deep and wide like a bowl or trumpet. The tragus and antitragus do not project beyond the helix but are turned in or depressed. The upper half of the helix turns over to form a shelf, like that of the lobule, and between the two is a part of the helix which does not project as much as the other parts. The hypo-onto-morph ear is usually thick and coarse, with rounded edges, and skin lines that are large and far apart, with large ridges between them.

The hyper-onto-morph ear stands in a contrast with the ear of the hypo-onto-morph. It is thin, long, delicately molded, and the helix is very slightly rolled in, being a mere margin rather than a heavy roll. The distance between the helix and anthelix is great above, and the helix disappears below except for a flat surface with a margin which merges into the lobule that is often absent, the helix then passing diagonally downward directly into the cheek. The concha is long vertically, and its border, the anthelix, projects so much that viewed from behind or in front it seems to be further away from the head than the helix. The tragus and antitragus point outward and often project beyond the helix. Looked at from behind, the rim of the helix presents the shape of the italic letter *f* or the old English letter ſ, and seems to have been seized between the thumb and forefinger and twisted upward and backward. The helix is therefore closest to the head at its lower extremity, the lobule, and also at the point where Darwin's tubercle should appear: and it is further away from the head at its summit, also at a point immediately behind the concha. This gives a wavy or spiral effect to the helix, which is very characteristic of this form of ear. The ear is thin and the lines are fine and close together.

The meso-onto-morph ear is somewhat intermediate between the other two forms although it has distinctive characteristics. It is large, heavy-looking and soft, more nearly flat than either of the other forms, and it has a lobule that forms a sloping shelf. The rim of the helix is large, oval and heavy looking. The ear is a large shallow bowl, with sides broad and flat, and a rim heavy but not rolled in very much.

The stability and permanency of the ear form have enabled me to classify types that would otherwise have been almost, if not absolutely, impossible of classification. The form of the face and head are molded by the development of the teeth, the enlargement of the bony sinuses around the nasal chambers, by the action of the muscles of mastication and by the extent of the erectile tissues of the nasal cavities, as well as by the action of the facial muscles through the expression of the emotions; but the ear form is laid down in cartilage, a stable tissue, it is not so prominent as the eyes, nose and mouth, and not so liable to natural and sexual selection, nor is it subject to physiological influences as other features, therefore, it has remained constant in form while other structures have undergone greater variation. The ear form has probably remained constant throughout tens of thousands of years since the three types became fixed, and in the mixtures of the different forms due to interbreeding the ear retains its

original characteristics to a great extent, and is found pure in the greatest variety of peoples in all parts of the world.

In a comparison of the dispensary negro population, or the negro patients of the Touro Free Dispensary, with the general negro population, or the negro people on the streets of New Orleans, it is found that the difference is as follows:

TABLE II.

| | Hyper- | Meso- | Hypo- |
|---|---|---|---|
| City Streets ..... | 48% | 45% | 7% |
| Dispensary ..... | 71% | 24% | 5% |

The hyper-onto-morph has a greater morbidity and this is coincident with the great number of the mulatto or light colored element among the negroes.

The hyper-onto-morph among the whites apparently has not a greater morbidity, because the percentages of the three forms on the streets of New Orleans and in the dispensary are practically identical:

TABLE III.

| | Hyper- | Meso- | Hypo- |
|---|---|---|---|
| City Streets ..... | 80% | 18% | 2% |
| Dispensary ..... | 80% | 19% | 1% |

The percentages of all forms in the total of the 894 cases utilized in this study are as follows:

TABLE IV.

| | Hyper- | Meso- | Hypo- |
|---|---|---|---|
| White ..... | 76.6% | 21.2% | 1.6% |
| Colored ..... | 45.0% | 49.0% | 6.0% |
| Total ..... | 59.4% | 36.3% | 4.3% |

Further analysis of the colored people given in Table 4 reveals the following figures:

TABLE V.

| | Light Colored 39% | Neutral Brown 44% | Sooty Black 17% |
|---|---|---|---|
| Hyper ..... | 55% | 42% | 28% |
| Meso ..... | 39% | 51% | 64% |
| Hypo ..... | 6% | 7% | 8% |

The significant facts here are that with an increase of pigmentation there is an increase of the hypo- and meso-onto-morph, and with a decrease of pigmentation there is an increase of the hyper-onto-morph. The light colored negroes include several albinos and all the octoroons, quadroons, mulattoes and sambos. The lighter color is due to recent mixtures of negro and white, and the darker colored are of purer African extraction. The indication is that the white is hyper-onto-morph and the negro is meso-onto-morph with some hypo-onto-morph.

Comparing Table 2 with Table 4 a discrepancy in the percentages of dispensary negroes will be noticed. This is due to the fact that negroes of all the clinics, including nervous diseases, eye, ear, nose, throat and genito-urinary diseases are included in Table 2, whereas only medical clinic cases are included in Table 4. The fact that more hyper-onto-morphs are found among the dispensary negroes of Table 2 would indicate that the hyper-onto-morph is more susceptible to nervous diseases, eye, ear, nose, throat and genito-urinary diseases than are the other two forms. This is undoubtedly true and will be demonstrated in part in the subsequent consideration of the diseases in detail.

In any consideration of this study it must be borne in mind that the personal equation is to be considered. A diagnosis is often overlooked because it is not looked for, but where the diagnosis is given it is self-sufficient evidence. The omission of a diagnosis cannot well apply to tuberculosis, however, because I was on the lookout for this disease in an effort to determine exactly, if possible, the physical type with which it is associated. Observations in the Philippines had convinced me that the disease is especially virulent among the hyper-onto-morphs. This has been confirmed both among the whites and among the colored people of New Orleans. Whatever else may be the result of this investigation the most emphatic substantiation of previous observations is here presented. If other facts are significant they stand for themselves, no effort has been made to prove or disprove them.

Each disease will be discussed here in turn, in relation to the three physical forms previously described.

### PULMONARY TUBERCULOSIS.

One hundred per cent more white than colored persons came to the Touro Dispensary afflicted with pulmonary tuberculosis among the 894 individuals examined, but this may be of no great significance, only the chance distribution in a random sample of the city sick; another thousand individuals might show a different proportion altogether. Neither does the one hundred per cent excess of males of both races who have tuberculosis, present any great significance, although both proportions are true and either may be significant. White people may be more susceptible to tuberculosis than colored people, and males may be more susceptible to tuberculosis than females, but this can be determined only by many thousands of records from all parts of the world and under all conditions of life.

When, however, practically every individual who is afflicted with tuberculosis, white or colored, male or female, is of one type, a type more distinct than any other human type, readily separable from the other types by differences in ear form, physiognomy and the length relations of body parts, then one comes to realize that less than a thousand individuals taken as a random sample of the city sick is sufficient to determine the susceptibility of such a type to tuberculosis. This type is the hyper-onto-morph, the slender individual, with long head, face, nose and extremities, and ear with everted tragus, and antitragus, and anthelix, and with rolled out helix. Only two individuals of the 134 afflicted with tuberculosis had no trace of the hyper-onto-morph form. No. 8797, white male, age 55, a modified meso-onto-morph with kyphosis, bronchitis and acute indigestion, and No. 47, white female, age 47, a modified meso-onto-morph with sacro-iliac subluxation. The remainder of those who have pulmonary tuberculosis are pure or mixed hyper-onto-morphs. In confirmation of this I have

records of 38 post mortem examinations of individuals found to have tuberculosis, of whom there are 11 white hyper-onto-morphs, 23 colored hyper-onto-morphs, 4 colored meso-onto-morphs, and 1 colored hypo-onto-morph. It cannot be said that no other form except the hyper-onto-morph will have tuberculosis, nor can it be said that all hyper-onto-morphs will have tuberculosis, but it can be said that the hyper-onto-morph is susceptible to tuberculosis. Small, slender, hyper-onto-morphs with small, round, everted ears were found with tuberculosis most frequently. Tall, slender, hyper-onto-morphs with everted ears that have no lobule are also susceptible and often have the most aggravated type, cavity formation with bronchiectasis.

Blondes as well as brunettes of the hyper-onto-morph form have the disease, but very few blondes are recorded, probably because of the preponderance of brunettes in New Orleans. There were a few cases like the following, however:

White German-American, blonde, male, age 23. Cough and expectoration for two months. Pharyngitis, laryngitis and signs of incipient pulmonary tuberculosis.

White, blonde, female, married, age 30. Hacking cough for one year, hoarse at times, and free expectoration. Has lost 30 pounds weight in the past 18 months. Dullness at the left apex with bronchial breathing and subcrepitant râles over this area.

The form of hyper-onto-morph that is believed to represent the primordial or original prehistoric type of hyper-onto-morph, is susceptible to tuberculosis but is very resistant to a fatal issue with the disease. This form of hyper-onto-morph is similar to the early cave man of Europe known as the Cro-Magnon race, and is intermediate between the Mediterranean form of the hyper-onto-morph, and the meso-onto-morph. This Cro-Magnon form of the hyper-onto-morph is tall, raw-boned, with large face—long and wide—prominent cheek bones and large nose and long everted ears with pendant lobules, and is distinctly different from the Mediterranean form of the hyper-onto-morph who is small, slender, thin, dark, with small face, long, thin nose and face, and ears of the everted form, although they are both similar especially in ear form. The Mediterranean race has been derived from forms similar to the Cro-Magnon race through life in cities, tropics, semitropics, etc., and may be only the attenuated form as a result of deficient nutrition, etc., incident to this life. The early form of hyper-onto-morph (Cro-Magnon) is at present more resistant to tuberculosis than the derived form (Mediterranean). A few illustrations will suffice.

No. 2287. White male, age 55. Hyper-onto-morph (Cro-Magnon). History of tuberculosis for 20 years, beginning with spitting of blood. At present emaciated, emphysematous, with pigeon-breast. Dullness over left infraclavicular region 4½ x 8¾ inches in area. Dullness at both apices and to angle of scapulæ behind. Râles below scapulæ. Temperature 97° to 99.5° F. Lost 2 lbs. in 3 years. Progress favorable.

No. 6487. White male, age 64. Hyper-onto-morph (Cro-Magnon). Was treated for pulmonary and laryngeal tuberculosis in the Touro Dispensary in 1907. Condition at present: Fair nutrition, process in lungs still limited to right apex. Dullness, bronchial breathing, squeaks in supraclavicular region. Few subcrepitant râles in infraclavicular region. Larynx shows no signs except slight roughening of plicæ interarytenoideæ.

No. 6616. White female, age 61. Hyper-onto-morph (Cro-Magnon). Was tested for pulmonary tuberculosis in Touro Dispensary in 1908. At present emaciated. Kyphosis. Scoliosis. Both apices involved. Temperature 99.3° F.

No. 6980. Colored (sooty black) male, aged 52. Hyper-onto-morph (Cro-Magnon). Four months previous had had one rib broken and two "strained." Spat blood for two days. Has since lost about 20 lbs. in weight. At present there is dullness at left apex posteriorly, with increased vocal fremitus over this area.

No. 7061. Mixed Negro-Indian female, age 57. Hyper-onto-morph (Cro-Magnon). History of fever, heavy cold, profuse expectoration, loss of weight, no appetite, bowels costive. At present emaciated, a few scattered râles over left side, where there is a peculiar grating sound with râles intensified over the 3d rib. Tubercle bacilli are present in the sputum.

No. 103. Benito, male Chinaman, age 88. Hyper-onto-morph (Cro-Magnon). Charity Hospital. Pulmonary tuberculosis.

These examples will suffice to show that the types are not racial but anatomical, and that the individuals attain an advanced age in spite of the tuberculosis.

There can be no doubt that the hyper-onto-morph of all kinds is susceptible to tuberculosis, and although the tendency may be aggravated by unhygienic conditions, it is largely responsible for the prevalence of the disease.

### Diseases of the Nervous System.

The diseases of the nervous system may be enumerated as follows: Neurasthenia 33 cases, paralysis (all kinds) 18, exopthalmic goitre 12, insanity 6, epilepsy 5, pellagra 5, tabes dorsalis 2, angioneurotic edema 2, sclerosis 1, herpes zoster 1, hysteria 1, torticollis 1, 87 in all. Of these 79 are hyper-onto-morphs, 6 are meso-onto-morphs and 1 a hypo-onto-morph, the last the individual with multiple sclerosis. Of the 6 meso-onto-morphs 2 have epilepsy, 1 paralysis, 1 pellagra, 1 hysteria and 1 neurasthenia. Notable is the fact that all the insane and those with exophthalmic goitre are hyper-onto-morphs.

There can be no doubt that the hyper-onto-morph is susceptible to diseases of the central nervous system.

### Diseases of the Alimentary Canal.

The diseases of the alimentary canal are the following: Constipation 161 cases, stomach 14, diarrhœa 6, typhoid fever 5, intestinal parasites 4, and appendicitis 2, 192 in all. Constipation cannot be said to have an affinity for any one form because 49 cases are meso-onto-morphs, 39 hyper-onto-morphs and 1 hypo-onto-morph, the remainder being mixed, 60 of the hyper-meso form and 13 of the hypo-meso form. The forms that have other alimentary troubles are 30 hyper-onto-morphs and 1 meso-onto-morph. Of stomach troubles 9 are simple such as gastritis, 4 are carcinoma, and 1 gastritic ulcer. All are hyper-onto-morphs. Post mortem examination of 3 individuals, dying of carcinoma, of the hyper-onto-morph class was made. Except for constipation, gastro-intestinal diseases pertain to the hyper-onto-morph. There are only 31 cases, however, which is a small number for generalization, but the indi-

cation is that the hyper-onto-morph is susceptible to diseases of the alimentary canal, although this is not so emphatic as for tuberculosis and the nervous system.

### CARDIAC AND RENAL DISEASES.

Affections under this head include those of the heart, circulatory system and kidneys, arterio-sclerosis and aneurysm. Affections of the heart and kidneys are grouped as one complex but arterio-sclerosis and aneurysm will be discussed separately.

Ninety-two individuals were diagnosed with heart or kidney troubles, and of these 80 are meso-onto-morphs, 11 are hyper-onto-morphs and 1 is a hypo-onto-morph. As will be noticed only 12 individuals had no indication of the meso-onto-morph form. Three of the hyper-onto-morphs have tuberculosis associated with the cardiac or renal condition and 4 are advanced in age. The inference is that the meso-onto-morph is most susceptible to cardiac and renal affections.

Arterio-sclerosis claims 24 meso-onto-morphs, 11 hyper-onto-morphs and no hypo-onto-morph, although 3 meso-onto-morphs have traces of hypo-morphism. The majority of the hyper-onto-morphs are well advanced in age, beyond 50 years, and this may account for the great proportion of them with arterio-sclerosis. The meso-onto-morph is most susceptible to this disease.

Fifteen meso-onto-morphs have aneurysm, only two hyper-onto-morphs (modified) and none of the pure hypo-onto-morphs have this affection, although 6 of the meso-onto-morphs have some hypo-morphism. Aneurysm, therefore, seems to strike the meso- and hypo-onto-morphs.

Post mortem examination of 17 individuals with cardiac or renal troubles gives 15 meso-onto-morphs and two modified hyper-onto-morphs. Seven other individuals with extremely dilated aorta are meso-onto-morphs. There can be no doubt of the association of heart and arterial affections with the meso-onto-morph and the kidney affections may be incidental to these.

### EMPHYSEMA, ASTHMA AND PLEURISY.

Contrasts and parallels enter here. Emphysema affected 12 hyper-onto-morphs and 4 meso-onto-morphs. Pleurisy attacked the same, whereas asthma attacked 6 meso-onto-morphs and two hyper-onto-morphs. Emphysema affected 12 white persons and 4 negroes, whereas the other two attacked 16 negroes and 7 white persons. The numbers are too few for generalizations yet they are suggestive. The negro may be susceptible to pleurisy yet the form of the negro most susceptible is the hyper-onto-morph. The negro likewise may be susceptible to asthma, yet the form of the negro most susceptible is the meso-onto-morph. The white people may be susceptible to emphysema, yet the form most susceptible is the hyper-onto-morph. That the meso-onto-morph appears to be susceptible to asthma may throw light on the nature of the disease. The indication is that its muscular nature is paramount. Post mortem examination of 19 subjects with pleural affections reveals 11 hyper-onto-morphs, 7 meso-onto-morphs and 1 hypo-onto-morph.

### ARTHRITIS.

Arthritis deformans claims 13 hyper-onto-morphs and 2 meso-onto-morphs; simple arthritis claims 12 hyper-onto-morphs and 2 meso-onto-morphs, one of which is mixed with hypo-onto-morph, therefore a greater tendency to arthritis on the part of the hyper-onto-morphs is evident.

### ANEMIA.

Every anemic individual observed is a hyper-onto-morph, 14 in all, including 1 with pernicious anemia.

### EYE TROUBLES.

Every individual with affections of the eye is a hyper-onto-morph, 5 of whom are white and 5 colored.

### VENEREAL DISEASES.

The relative proportion of the different forms infected with venereal disease is almost exactly the same as the relative number of the different forms in the total number examined, therefore no inferences may be drawn. There seems to be, however, a greater tendency on the part of the hyper-onto-morph to syphilis. There are 31 hyper-onto-morphs to 14 meso-onto-morphs with syphilis, whereas there are 24 hyper-onto-morphs to 17 meso-onto-morphs with other affections of the genito-urinary apparatus.

### TRAUMATIC.

Accident cases include a large number of sacro-iliac subluxations, of which all among the white people are hyper-onto-morphs, whereas 11 of the 13 among the colored people are meso-onto-morphs. This is another way of saying that the white people are hyper-phylo-morphs and the colored people are meso-phylo-morphs to a large extent. Other accident cases are distributed among the three forms in about the normal proportion.

### ACUTE INFECTIOUS DISEASES.

These include the following cases not before given:

Bronchitis 14, malaria 10, rheumatism 6, tonsilitis 10, coryza 6, jaundice 5, measles 3, mumps 2, cystitis 3, boils 1, endocarditis 1, pneumonia 1, influenza 1, septicemia 1, sore throat 1, 64 in all, of which 36 are hyper-onto-morphs, 23 meso-onto-morphs and 5 hypo-onto-morphs. The last is a higher proportion than normal, the other two have about the usual proportion. It may be that the hypo-onto-morph is susceptible to acute infections, but this is only suggested, not proved.

The other diseases are so few in number and so diverse in form that deductions would be unfair.

### INFERENCES.

The present study has demonstrated that morphologic entities which may be called character-complexes may be distinguished by their ear form, physiognomy and body parts. Three definite forms may be segregated from any group of

people, and these three forms I have designated hypo-onto-morph, meso-onto-morph and hyper-onto-morph, depending upon their apparent position in the scale of evolution or development—their ontogenic position.

The hypo-onto-morph may be susceptible to acute infectious diseases and cardio-renal affections, but their number is too few for final judgment.

The meso-onto-morph is susceptible to disease of the tissues derived from mesothelium, especially to diseases of the circulatory system and kidneys.

The hyper-onto-morph is susceptible to diseases of the tissues derived from epithelium, especially to pulmonary tuberculosis and diseases of the alimentary canal and central nervous system.

# THE LAST ILLNESS OF LOUIS XIV.*

By Carroll E. Edson, M. D., Denver, Colorado.

The deaths of kings who die in their beds are usually recorded by the bare statement of the date, and the historian passes on to expound his theory of the political significance of the reign just closed. The human side—the sickness, the suffering and the dying of a man—which the physician sees, is rarely told, and we are often ignorant of the cause of death.

The last days of Louis XIV have been described with great precision by several memorialists who were witnesses of the events; Saint Simon, Dangeau, and Anthoine, who was his *valet de chambre,* have all left accounts, and the recent biography of Georges Mareschal, who was the first surgeon to the Grand Monarch, has supplied further most interesting details of the illness. I have thought that an account of it might be worth your listening to; for it will tell not only the story of the pathology of the King's death, but between the lines give some interesting glimpses of the state of things medical in the year 1715.

First, a few words of introduction. The last two years of the King's life had been full of trial and disappointment—official and personal sorrows. The Treaties of Utrecht and Rastadt (April, 1713 and March, 1714) had brought to a close the long and exhausting war of the Spanish Succession, and with it put an end to the great ambitions of the King for an extended family dynasty. The failure of his arms and plans were heavy disappointments. At home he had the sorrow of seeing the direct line all but wiped out by death. His only son, Monseigneur, had died in 1711 (April 14), leaving as dauphin the Duke of Burgundy. In 1712 the Duchess of Burgundy, a great favorite of the King, died suddenly on February 11. The Duke died with equal suddenness on the 18th, and their son, the little dauphin, Duke of Brittany, followed them to the grave on March 9th, leaving as direct heir to the throne the Duke of Anjou, great-grandson to Louis, a delicate child of two years.

A year later, on May 4, 1714, the Duke of Berry, the remaining grandson, died. This brought the throne but one life away from the Duke of Orleans, the King's nephew, whom he cordially disliked. To these tribulations of France and family were added the trials of conscience over the Bull Unigenitus of Clement XI and the Jensenist opposition. So much did Louis worry over this matter, that in March, 1714, M. Fagon, the first physician, advised the King that he ought to quiet himself in the matter of this constitution, if he did not wish to impair seriously his health. But the pressure of Madame de Maintenon and the Jesuit party prevented any compromise, and the Cardinal Noailles, Archbishop of Paris, and the fifteen Jensenist bishops remained unreconciled to the time of the King's death.

To all these anxieties was added that of the financial exhaustion of the realm and the problem of raising revenue from a diminishing and starving population, to maintain the extravagance of the court at Versailles. "The whole nation was starved and became dreadfully thin; from this time onward for a century the caricaturist draws the Frenchman as a thin, tall, lantern-jawed creature." "Starved skeletons clamored round the gates of Versailles, and could hardly be kept out of the royal presence." The King had always a very robust appetite, and, while the population starved, ate so much that the courtiers were alarmed. When we bear in mind that all these cares were laid on the shoulders of an old man of over seventy-six (he was born in 1638, and had reigned since 1643), we can the more readily appreciate the reason for his illness.

For over a year the King's health had been gradually failing. His household valets had noticed it, and watched the decline without daring to say a word. Fagon, the first physician, himself much broken in body and mind, was of all the household the only one who noticed nothing. Mareschal, the first surgeon, spoke of it to him several times, but was always curtly rebuffed. By spring the King's feebleness was so marked—and a rumor that his legs were swollen being confirmed by the British Ambassador, who peeked under the table to see—that wagers on his health were laid in the clubs of London. Learning of these wagers, the King tried to conceal the uneasiness they caused him, and on June 12 (1715), moved to Marly, his favorite residence, about four miles from Versailles. Here he devoted himself assiduously to his usual diversions of walking, hunting and holding military reviews. Just before the King's departure, Mareschal, who had in vain tried to arouse Fagon to an appreciation of the King's condition, felt it his duty to warn Madame de Maintenon of her husband's danger. Going one morning to her apartments, he told her what he foresaw, and how grossly Fagon was deceived. He assured her that the King, whose pulse he had frequently felt, had for some time been running

* Read at a meeting of the Denver Medical History Club.

a little fever; that his constitution was so good that with proper care there was still plenty of room for recovery; but that if the illness were allowed to gain headway there would not be. Madame de Maintenon was much provoked, and all Mareschal got for his zeal was a storm. She told him that it was only personal enemies of Fagon who disputed his opinion of the King's health, and that the ability, watchfulness and experience of the first physician put him above any mistake. So Mareschal learned, as have others, that it is folly to discuss her physician with a woman, and affairs went on in the old way of high living, heavy eating and extravagance, until the fatal illness came upon the King.

From early in July Louis had fixed upon August 10 for leaving Marly; but on that morning he was indisposed, and said to Mareschal that he felt greatly confused, and thought a bleeding would help him. All his life he had been accustomed to frequent venesections. Fagon, however, ruled the proceeding unnecessary, and the King returned that evening to Versailles. The next day the confusion continued, and on the following morning he felt a severe pain in his left leg. Fagon attributed it to an attack of sciatic gout, and paid no attention to it other than to give the King a purge. By night, however, the King was worse, and as the first physician prescribed no new remedy, Blouin, the King's first valet, who was devoted to him, insisted that a consultation be called between the physicians of the court and those of Paris. He only expressed the general opinion; for at the same time Marshal de Villeroy wrote to Madame de Maintenon: "You are with the King, Madame; you see him, and you know his condition. I have nothing to tell you or to suggest, save this: Are you willing that the opinion of Fagon alone shall decide the King's life? The lowliest villager, when his family think him in danger, gathers the ablest doctors he can afford for consultation. Shall the King be the only one in his realm deprived of such help? Can M. Fagon wish to decide so important a matter alone? In truth, Madame, it makes one shudder. All think as I do, but dare not say it."

At first Fagon made objections; but reflecting on the tremendous responsibility he assumed, gave in, and four of the leading physicians of Paris were summoned for the next day.

In spite of the pain of his supposed sciatica, the King, after mass, held a public reception, giving audience to the Persian Ambassador, and remained standing throughout the ceremony. We are reminded of King Edward VII holding the privy council the first day of his last illness.

At six that evening, while going to Madame de Maintenon's apartments, which were located near his on the first story of the chateau, the King was taken with such severe pain in his leg that he could scarcely walk the few steps necessary. Within an hour the pain had increased so that it was necessary to send for Mareschal, the first surgeon. He examined the leg in company with Fagon. They found only a little redness just below the garter. Mareschal rubbed the leg with hot cloths, which gave a little relief to the pain, and the King was able to go back to his room. About eleven o'clock the same pain returned so severely that it was decided that Fagon should stay by the bedside that night with M. de Chancenetz, the first gentleman-of-the-chamber in residence, whose duty it was, while the physician-in-ordinary, Boudin, the first surgeon, Mareschal, and the apothecary, Biet, lay down in the large counsel chamber adjoining with the valets Anthoine and Bazire. Mareschal was called on many times in the night to rub the King's leg; but it gave only short respites from the pain.

The next morning, August 14, the physicians summoned by Fagon from Paris arrived at Versailles. The names of two have come down—Helvetius and Falconet. After feeling the King's pulse, they retired to the councilroom for consultation. Anthoine in his journal wrote: "One never saw better the small resource there is in medicine, for after a long debate they decided that the King should be given some asses' milk, and a few hours later a second consultation determined them to suspend the decision reached at the first in as much as the pain had increased after noon." At the first of the 18th century asses' milk was considered a very efficient remedy. As De Bieire says, "It had the advantage over the specifics of that absurd medical epoch of being harmless."

On the 15th the King had less pain, and there was hope of a speedy recovery, but he still had great difficulty in moving.

The morning of the 16th, after a profuse night sweat, he could hardly be lifted from the bed to an armchair for his valets to dry him and change his linen, so much did the least movement increase his pain. From this day on, so long as he was able to leave his bed, it was Mareschal, his surgeon, and the Marquis de Chancenetz who carried him to his armchair.

On the 17th, however, the King got into a wheel-chair, and went to Madame de Maintenon's. In the evening the pain increased, and Mareschal was called to dress a sore on the leg, which, till then, had been thought unimportant. To the first surgeon the diagnosis of gangrene was manifest; but he held his tongue that night, and Fagon talked of sending for some Bourbonne water, and declared there was no fever.

Thus the first physician persisted in his lack of insight. His opinion no longer deceived any one, "for the condition of the King" writes Saint Simon, "of whom I have more accurate news from Mareschal, shows clearly that he can last but a few days."

On the 19th the nature of the King's illness was only too sure. When the doctors came at two o'clock to see the leg dressed, they found a great change. It was badly swollen and there was a black area on the instep.

From this time Fagon appeared to be uneasy. On the 20th he ordered the leg kept for an hour in a bath of spiced Burgundy wine; but Mareschal's frictions were the only things which gave any relief. The bath had no effect. Fagon now proposed, himself, a second consultation, and the physicians were again summoned from Paris on the 21st. "They felt his pulse in order of seniority," says Anthoine, "and appeared satisfied to find less fever." In spite of this optimism, the King grew worse toward night. Mareschal came to dress and rub the leg, as he did almost every hour. He found the process greatly extending, and told Fagon, who

proposed to the King to have the physicians out from Paris again. To ask almost daily consultations, after obstinately attempting single-handed the care of the King, showed that Fagon at last appreciated the soundness of Mareschal's repeated advice.

Four other physicians were called in the next day, August 22, among them Dodart and Dumoulin. At the close of their consultation they prescribed quinine and more asses' milk.

On the 23d they returned, eager to verify the improvement brought about by their desperate remedy. Mareschal unbandaged His Majesty's leg in the presence of the physicians, who did not dare show their surprise at finding it in so bad a condition, and laid the blame on the poor female ass. They made several visits during the afternoon. The King was very restless, and Mareschal was kept busy unbandaging the leg, rubbing it, and rebandaging it.

On the 24th Fagon called another general consultation of all the physicians of the court, and all those of Paris who were at Versailles. They came in full ceremony, felt the King's pulse, and ordered the leg wrapped in cloths soaked in camphorated brandy. In the evening the leg was quite black to the foot.

The condition being thus clearly surgical, and Mareschal's opinion the official one, he could speak to the first physician with the certainty of being listened to. He profited by it to do several of the Masters of the Surgeon's Guild the honor of calling them in consultation over the King, as Fagon had done the physicians. The first surgeons called in were Ledran, Arnault, Gervais, Dionis and Petit, with some others of the more renowned.

Up to this time the King, in spite of his suffering, had not ceased for a single day to attend to the affairs of state and to receive his ministers. Changing his routine as little as possible, he had forced himself to dine in public, a long and tedious ceremonial, and to pass the evening in his study with the princesses. But from the 24th of August he never left his room.

In the afternoon of the 25th the surgeons, Masters of St. Côme, arrived at Versailles at two o'clock, and inspected the King's leg in the presence of the court surgeon and physicians. They looked at each other and silently shook their heads. Their faces showed the hopelessness of cure. At their consultation they decided to make a few small incisions in the leg to give outlet to the pus. This operation was put over till the next day, however.

A few hours after the surgeons' departure the King had a fainting spell, and realizing the gravity of his condition, gave no further thought to concealing it. He asked for extreme unction, and received the sacrament piously; then, having given audience to his ministers, he said an affectionate word to each of the princes.

On the 26th about ten o'clock the surgeons returned to see the incisions made in the leg. Mareschal did the operation in presence of the other surgeons and physicians; but, although he made deep cuts, His Majesty felt nothing, till going each time higher and deeper, at last the King cried "Oh, Mareschal, you hurt badly."

Several different accounts are given of this proceeding, all written more or less with courtly flattery. I shall not recount them, as they have too much the color of fiction, and no bearing upon the medical narrative. One, however, seems fairly authentic, at least in its essentials. At the close of the operation the King said to Mareschal, whom he had always been fond of and implicitly trusted: "I see there is no cure. Be frank with me. How long have I to live?" "Sire," said Mareschal, "we may hope until Wednesday." "My warrant for Wednesday, then. I will be ready," said the King. At once he began making his final arrangements. About noon he had the Duchess of Ventadour bring him the little dauphin, to whom he counselled moderation and the duty of solacing his people. "You are soon to be King of a great realm. What I commend most earnestly to you is never to forget the obligations you owe to God; remember that you owe all you are to Him. Try to keep peace with your neighbors; I have been too fond of war; do not imitate me in that, nor in my too great expenditure." Then calling the Duke of Orleans, the regent-to-be, he arranged with him the measures to be taken on his death, adding, "You are now fortunate, for you have one King in the tomb and the other in the cradle." As Kitchin says, it was a courteous and pleasant manner of parting with a kinsman whom he had never liked or trusted. At half-past twelve he heard mass in his chamber, and after an interview with Cardinals de Bissy and de Rohan, sent a message of good will to Cardinal Noailles. He then called to his bedside the officers who were in the apartments, and bade them a gracious adieu, after which he had the princesses of the royal family come in. They had been waiting in the adjoining robing-room, and entered in the manner then considered most becoming such an occasion, wailing and crying at the tops of their voices. "Though they were allowed in but a moment," writes Dangeau, "I do not see how the King endured it." In spite of the fatigue of the day, which we must admit was a pretty busy one for an old man with senile gangrene, the King picked up a bit toward night; and when Mareschal dressed the leg, he found the gangrene had not extended.

The next day, the 27th, the patient was about the same. He passed the day with his confessor, the Jesuit, Le Tellier, and Madame de Maintenon.

On the 28th he was so weak that they thought him dying; but he rallied and said to his sobbing attendants, "Why do you weep? Did you think I was immortal?"

About eleven o'clock a doctor from Marseilles arrived at the chateau, claiming to have a sovereign remedy against gangrene, and pretending to be a doctor of the Faculty of Leipzig. Then, as now, the surest and newest pharmaceutics seemed to be "made in Germany." The man had been sent from Madame de Maintenon to Père Le Tellier, and from him to Fagon, who had passed him on to Cardinal de Rohan, and then to Mareschal. Everywhere he was turned down as a quack, a sorcerer or a fool. Mareschal, who was always

courteous, asked the German what he hoped to do, knowing the King could live but a day. "I have two elixirs," he said, "one will give the King some appetite, for he has taken no food for a week. The other will at least retard the progress of the gangrene, if it does not stop it." "I have not faith in what you say," said Mareschal, "but there is no harm in trying everything." Who of us has not consented to such nostrum administration under similar conditions of family distress.

Fagon, staunch old regular, tried to oppose the trial of this empiric, at which the charlatan abused him so roundly and brutally that the old physician, who was accustomed to do the bullying himself and to be respected even to trembling, was much abashed, and retired. With the consent of the Regent, the quack, who called himself Dr. Lebrun, gave the King ten drops of his elixir in three teaspoonfuls of Alicante wine. The drug was said to have been made from the carcass of an animal in the same way that English drops were made from the skulls of men.

During the 17th and well into the 18th century, *liquor cranii humani* was a highly prized remedy, prepared from unburied skulls, those of criminals by preference. On this point all authorities were agreed: that the remedy was of little use unless prepared from the skull of a young man who had died a violent death. In London the druggists sold skulls on which was grown a little green moss, like that on oak trees. Pomet in 1694 wrote, "These skulls mostly come from Ireland, where they let the bodies of criminals hang on the gibbet-tree till they fall to pieces." The market price varied from eight to eleven shillings, according to the size and the growth of moss. Germany was the principal purchaser. During the last illness of Charles II of England, who died from a stroke of apoplexy, one of the remedies used was twenty-five drops of the spirit of human skulls.

The charlatan's dose revived the King for a few hours, and fickle court rumor spoke of a cure; but the impostor had not as yet been shown the leg, and his assurance wilted when he saw it gangrenous to the knee.

The day of the 29th, during which the King took several doses of the elixir, was fairly comfortable. In the evening he was able to eat two biscuits soaked in wine—the first food in several days. At half-past ten, when Mareschal dressed the leg, the gangrene had extended above the knee, and the thigh was much swollen.

During the morning of the 30th, the King was in an almost continuous state of collapse, and Lebrun left, saying he had come too late. The faithful Mareschal did not leave the bedside, and several times was on the point of calling the priest. No one was in the room save the most necessary attendants, Madame de Maintenon and Mareschal. About five o'clock, the King being unconscious, Madame de Maintenon, who, it must be remembered was eighty years old, left the chateau and went to St. Cyr.

There was no change on the 31st: the King was unconscious all day, only his great vitality holding death at bay. In the afternoon the Duchess of Maine (wife of the King's bastard by Madame de Montespan), insisted on giving the King a remedy devised by the Abbé Aignan for small-pox. No opposition was made. At ten o'clock the prayers for the dying were repeated. The King appeared to rouse a little, and to repeat mechanically the responses, and again became unconscious.

About five o'clock in the morning, Sunday, September 1, the King lost absolutely every sign of life save respiration. Mareschal uncovered the leg in presence of the medical staff and several distinguished courtiers. The whole leg and thigh was gangrenous, and the process had extended up on to the trunk. Two hours later the agony began, and lasted until quarter of nine, when it ceased with a few sighs and two tracheal gasps, without any convulsion. Louis XIV was dead.

While the Duke of Orleans and the princes went to salute the little dauphin as King, George Mareschal with the help of the chamber-boys took the body from the bed, changed the linen, and replaced it in a sitting posture in the same bed. He placed a crucifix in the hand, and to keep the mouth closed tied a bandage under the chin, pinning it on each side to the night-cap. It was in this position that the Court was admitted to view the body in the afternoon.

The next day, September 2, the autopsy was made. It had long been the custom to examine the bodies of all members of the royal family after death. It was this routine examination which enabled Mareschal to disprove the unpleasant rumors of poisoning when the family of the Duke of Burgundy died in such rapid succession. The proceeding was one of great ceremony, and known officially as "The Opening." The officers of the chamber and of the wardrobe carried the King's body into the great antechamber of the royal apartments, and placed it on a table—probably that at which the King was accustomed to dine in state. The Regent designated the Duke d'Elbeuf and Marshal Montesquion to preside at the ceremony. The Duke of Tresmes, first gentleman of the bedchamber, and the Marquis Maillebois, master of the wardrobe, were present ex-officio. The first physician, Fagon, took his position near the body, having behind him in addition to the medical household of the King, two doctors from the Faculty of Paris, deputed by the Dean according to custom. When all the spectators were in place, the first surgeon and the first surgeon in succession, George Mareschal and his son Louis, with the help of their assistants and two Masters of the Guild of St. Côme, delegated by custom, divested the royal body of its robes of state and covered it with a sheet, which wholly concealed it. Then George Mareschal fulfilled the last duty of his office, and in person began the autopsy. He folded back the cloth from the head, and sawing the skull, exposed the brain. Placing a napkin at once over the part examined, he opened the thorax and removed the organs. Again covering the chest, he passed to the belly, taking out the intestines and measuring their length. After this he laid open the leg its entire length. As the first surgeon dissected each part or organ, the first physician dictated the formal notes to be recorded in the report. Amid these solemn surroundings Fagon once more asserted the predominance of

medicine over surgery. The autopsy over, the physicians drew up their report, which reads:

**September 2d, 1715, the body of the King, Louis XIV, surnamed the Great, because of his rare virtues, was opened by M. Mareschal, first surgeon of the King, in the presence of His Majesty's physicians and surgeons and other persons appointed by the Duke of Orleans to be present.**

**The exterior of the left side was found gangrenous from the extremity of the foot to the top of the head; the skin peeling everywhere, but less on the right than on the left; the body extremely distended and bloated; the bowels much altered with inflammation, especially those on the left side; the large intestines extraordinarily dilated. The kidneys were fairly normal and natural; but in the left one was found a small stone similar to those the King had several times passed without pain while in health. The liver, spleen and stomach were in a normal condition, both externally and internally. The lungs, as well as the chest, normal; the heart in very good condition, of ordinary size; the terminals of the great vessels ossified. All the muscles of the throat gangrenous. On opening the head, the dura mater was found adherent to the cranium, and the pia mater marked with black areas along the falx; the brain sound, in natural condition, outside and within. The interior of the left thigh, where the King's disease began was completely gangrenous in every part; all the blood in all the vessels totally disorganized, and very scanty in amount.**

**Done at Versailles this second day of September, 1715.**

The autopsy finding of the exceedingly dilated colon is of great interest, and explains to us, if it did not to his physicians, much of Louis XIV's medical history. All his life he was accustomed to take regularly rather drastic purges, and for years had frequent recourse to high enemata. Indeed it was the Grand Monarch who made the enema truly fashionable in Europe. The journal of the King's health, kept by the first physician, shows that between 1647 and 1715 the King took by reason of need or precaution between 1500 and 2000 purgative doses—and purges in those days were not candy cathartics. In addition there is a record of many hundred enemata. We can well understand the need.

Mareschal allowed all the physicians present at the ceremony to sign before doing so himself; but protested against this subordination of the first surgeon to the ordinary physicians. In 1748 one of his successors, M. de la Martinière, performed an autopsy on the *petite* Madame, daughter of the dauphin, refused to sign the report, claiming that his name should follow immediately that of the first physician.

After signing the report the physicians withdrew, leaving Mareschal to embalm the body. The first apothecary had prepared a powder of twenty-six aromatic drugs, and another into which entered twelve kinds of odorous gums. He brought in also a jar containing a mixture of oil of laurel, liquid styrax and balsam of copaiba.

Mareschal filled the King's heart with the balsam powder, placed the organ in a lead box, which he enclosed in a casket of sandal-wood, which in turn was sealed in a silver reliquary. Then he put the royal entrails—not only the intestines, but all the viscera removed at the autopsy—into a similar series of three cases. Layers of aromatic powder separated each organ from the adjoining ones.

By the King's wish the first reliquary was to be taken to the chapel of the Jesuits in the Rue St. Antoine; the second to Nôtre Dame.

The Duke of Tresmes then held the King's head, as custom dictated, while Mareschal stuffed it with powders and gums. He did the same with the body, and opening the four limbs filled them with the same mixtures. Then with a brush he smeared the whole body with the balsam prepared by the apothecary. Wrapping the head, the limbs and the trunk with linen bandages, he placed the body on a large, waxed sheet, which he bound stoutly about it, "as one would do up a package to go by express." (Literally: stagecoach.) Having put a shroud on the corpse, his duty was done. The Duke of Tresmes and the Marquis of Maillebois, gentlemen of the bedchamber, placed the body in a double casket.

After the body was taken to its last resting place at Saint Denis, the King's detractors in allusion to Mareschal's preparations, published a pasquinade.

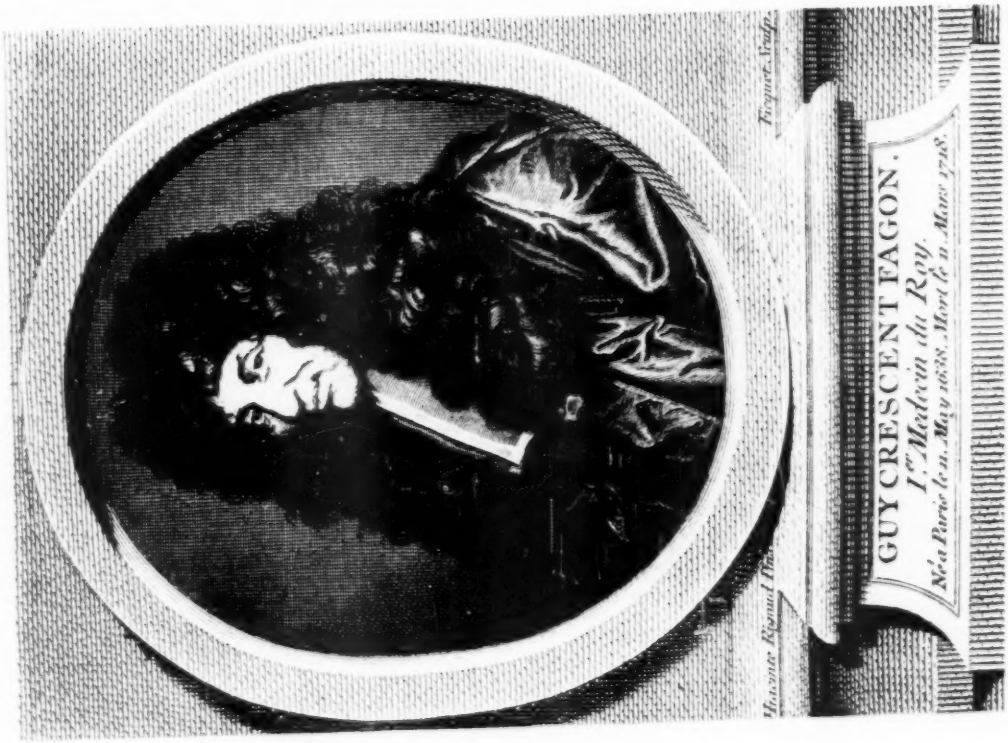
*À Saint Denis comme à Versailles*
*Il est sans cœur et sans entrailles.*
**Now at St. Denis as at Versailles**
**He has no heart and no entrails.**

But far from partaking in this untimely joy, the first surgeon of Louis XIV said with the officers of the court, "We have lost a great King and a good Master."

If I have not already tired you with this rather long account of a simple case of senile gangrene occurring in the course of a general arterial sclerosis brought on, doubtless, by the many years of gross overeating and imperfect colonic elimination, you may be interested in knowing a little about the two principal attendants of the King, his first physician and first surgeon, whose portraits I am able to show you.

Guy Crescent Fagon, the first physician, was born in Paris, May 11, 1638, of noble blood. His mother was niece of Guy de la Brosse, founder of the Royal Botanic Gardens. He received his M. D. degree from the University of Paris, and took for his thesis the circulation of the blood, maintaining Harvey's new theory somewhat to his disadvantage. He was made botanist to the King, and travelled extensively in Auvergne, Languedoc, Provence, the Alps and the Pyrenees at his own expense. He was later Professor of Botany and Chemistry at the Jardin des Plantes, and director of the Gardens. He was editor of the Hortus Regius, 1665. In 1677 he was chosen by Mme. de Scarron as physician to the King's bastards; later she obtained for him the appointment as physician to the Queen, and on the death of Maria Theresa in 1683, the post of first physician to the royal children. In 1693, as Madame de Maintenon, she secured his appointment as first physician to the King, a most important and lucrative position. While you are looking at this picture of the man, I will read the description which the Princess Palatine wrote: "Of Doctor Fagon's appearance you can hardly form an idea. He has thighs as slim as a bird's legs; a mouth filled with teeth which are all yellow and slimy; projecting big lips which give him a protruding mouth; drooping eyes; a decidedly yellow complexion; a narrow face, and an air as evil as he is in reality." This is the pen sketch of a woman who did

GEORGES MARESCHAL,
Seigneur de Bièvre,
Chevalier de l'Ordre de Saint-Michel,
Premier-Chirurgien de Louis XIV et de Louis XV.
1658-1736.


GUY CRESCENT FAGON.
1er Medecin du Roy.
Né à Paris le 11. May 1638. Mort le 11. May 1718.

not like the man; for he had many enemies, as one in his position must. Another satire on him ran:

**He lives only by his regimen,**
**Skinny, bow-backed, hideous;**
**He shambles like a quadruped;**
**From his figure you'd take him for a Zed.**
**A forest of black hair surrounds**
**His tousled head and face.**
**He terrifies the populace;**
**For all who see him think at first**
**They look on death's own skeleton.**

Hated by some, feared by all, he was still loved by many, and must have been a man of no little character and force; for he was held in high regard by the Ministers, and filled for over twenty years his responsible position, to the entire satisfaction and confidence of an exacting monarch in an intriguing court.

Though the physician to a most robust and gormandizing King, Fagon himself was exceedingly delicate, and dependent on the most scrupulous care of his health. He was asthmatic, and subject to epilepsy. Sweating was his great panacea as he grew older, believing that one of the causes of the infirmities of age was due to the harder skin allowing less transpiration than the delicate skin of youth. Carrying out this theory, he himself took a heavy sweat every night, sleeping under four fur robes, so that some nights he had to change his linen as many as ten times. He also held that the aged ate too much, and himself often ate but one egg for his day's nourishment. By 1699 this regimen had reduced him to extreme feebleness. He began to have symptoms of stone in the bladder, which by 1701 could no longer be borne, and confined him to the bed. At last he was sounded by Mareschal, the diagnosis confirmed, and the old man of sixty-three came to the dreaded lithotomy. Refusing to be bound on the table, he declared he had ample control of himself to keep quiet, which he did through a long operation of perineal section, without any complaint or allowing a word to escape which showed suffering. He talked quietly with his surgeon during the operation; but when it was over and Mareschal gave some directions about his food, the old, first physician asserted himself at once and said, "I had great need, sir, of your hand; but I have none for your head to arrange my regimen of living." This retort gave great satisfaction to the physicians for many years.

It was the successful outcome of this operation which cemented the friendship of Fagon to Mareschal, and on the death of Felix, the first surgeon, shortly after, Fagon was very instrumental in having Mareschal appointed to the vacancy.

Fagon died in 1718. So far as we know, the only book he published was "A Treatise on the Qualities of Quinine," in 1703.

The life of George Mareschal, the first surgeon, reads like a romance. I will give you but the briefest outline to-night, for I hope later to write more fully the interesting story. He was as handsome as Fagon was ugly, as gracious as the first physician was crabbed; a man of wide tolerance, but inflexible on all questions affecting his honor or the advancement of his chosen profession.

The son of an emigrant Irish captain of cavalry under Louis XIII, he was born at Calais, April 8, 1658. His parents were both poor, and he was left a double orphan at the age of thirteen. He made his way to Paris, and obtaining a situation as a lad in a barbershop, hoped to obtain an education in surgery. He was unable to pay for full apprenticeship or for the examinations necessary to enter the guild of surgeons. His industry and determination, however, won him notice, and a happy friendship led to his obtaining a free house-officership in one of the convent hospitals. His skill and ability were marked, and he rapidly advanced; gained a mastership in the surgeons' guild of St. Côme, and became attending surgeon to the Charity Hospital. He developed great skill as a lithotomist, and rare judgment in his work, so that in 1696 he was called in consultation when Louis XIV was suffering from a large carbuncle, which the surgeons were failing to open sufficiently. His prompt insistence that they resort to radical incision doubtless saved the King's life, and brought Mareschal great credit at court, while his masterly diplomacy saved the reputation of the regular surgeons, and won their regard.

In 1703, Mareschal became first surgeon to the King, who, throughout the remainder of his life made not only a professional counsellor, but a close personal confidant of him—a trust which Mareschal amply justified. In 1707 he was ennobled by Louis, and became the Seigneur de Bièvre. He obtained the reversion of his office for his son Louis, and so high was the esteem in which he was held that on the wedding of this eldest son the marriage register was signed in person by every member of the royal family. After the death of Louis XIV Mareschal was reappointed first surgeon to the new King, Louis XV. To this appointment the good will of the Regent was of course essential, and though the Duke of Orleans was in every point of the opposite party to the late King, yet it was Mareschal, the King's surgeon, who had held out for a professional and non-political report on the autopsies of the royal princes in 1714, when rumor charged their deaths to poison, and practically alone, fully exonerated the Duke.

The great interest of Mareschal's life was the organization of surgical practice throughout the Kingdom, and freeing it from the domination of the physicians. Before he died he had succeeded, though with many a hard fight, in bringing all surgical study and license to practice under the sole jurisdiction and direct control of the first surgeon, who was made also ex-officio chief of surgery of the kingdom. This organization remained practically unchanged until the French Revolution wiped out every former system of the land.

He was made a Chevalier of the Order of St. Michael in 1723, and in 1732 founded the Royal Academy of Surgery, to whose proceedings he contributed some of the early papers.

He died December 13, 1736, possessed of large estates and [illegible] fortune; held in high regard and affection by his colle[illegible] a man of character and unblemished reputation.

# NOTES ON NEW BOOKS.

*The Ocular Muscles: A Practical Handbook on the Muscular Anomalies of the Eye.* By HOWARD F. HANSELL, M. D., and WENDELL REBER, M. D. Illustrated. $2.50. (*Philadelphia: P. Blakiston's Son & Co., 1912.*)

This book is interesting, not so much for purposes of instruction as for setting forth in black and white the clinical views of the writers, who have devoted particular attention to the consideration of the eye muscles. Apparently they have been minute in their investigations, possibly too minute, especially in connecting bodily distresses of various sorts with Exophoria. "Out of 200 exophorics 140 gave a testimony of more or less vertigo." 70%! The reviewer confesses himself as not being in accord with a number of the ideas contained in this book, but the book covers a subject in which differences of opinion have for a long time existed. As a supplementary text-book for their own students this book may have a place, but for an impersonal exposition of the eye muscles and their anomalies, we would refer the student to other works. B. B. B., JR.

*The Treatment of Short-sight.* By PROFESSOR DR. J. HIRSCHBERG. Translated by G. LINDSAY JOHNSON, M. D. (*New York: Rebman Company, 1912.*)

This is rather an interesting little book on the subject of Myopia, not going into the subject exhaustively, but narrating the personal experiences of the author in this class of cases. The conclusions that the author reaches will probably meet with the approval and endorsement of most practicing oculists of experience. Some very useful and interesting statistic tables from Tscherning (p. 4), Donders (p. 13), Horner (p. 23), and the author's (pp. 23, 26, 59 and elsewhere) are included in the little book. B. B. B., JR.

*Untersuchungen ueber die Struktur der Blutzellen.* Von PRIV.-DOZ. DR. ALFRED V. DECASTELLO, Assistent, und DR. ALEXANDER KRIUKOFF, derzeit Hospitant der medizinischen Klinik in Innsbruck. $4.00. (*Berlin u. Wien: Urban & Schwarzenberg; New York: Rebman Company, 1911.*)

This monograph represents the result of a careful and painstaking study of the structure of the blood cells—a difficult subject. By the adoption of the most advanced methods of fixation and staining, preparations were made and then studied under the best available conditions—magnification up to 3000 times. The authors say that they frequently spent many hours in the examination of a single cell which was then carefully drawn. The splendid illustrations, 102 in number, included in the eight chromolithographic tables demonstrate the value of their study.

The results have not only brought out more clearly many known facts concerning the structure of the blood cell but have also pointed out new facts, as for instance: the demonstration of cells with tail like nuclei, amitotic division of splenocytes, and the occurrence of large complexes of erythrocytes in the circulating blood. The authors further conclude that the conception of the cell and the nucleus as a vesicle surrounded by a membrane is incorrect and that cell body as well as nucleus is composed of a tortuous matting of fibres which composes the greater portion of the cell. Nucleus and protoplasm do not represent anatomically and functionally distinct portions: they are closer related and nuclear fibres reach out into the protoplasm and become a part of the latter. The granules represent transformed segments of protoplasmic fibres. The blood platelets arise from the cytoplasm of leucocytes and show structural differences according to the type of cell from which they have arisen.

The above conclusions are of a great deal of interest. In many ways they differ from the accepted teachings, but it would lead too far to discuss these opinions in relation to the extensive recent hematological literature. It is to be regretted that the authors have included so little discussion of the literature in the presentation of their findings, which will limit the value of the volume.

*Post-Mortems and Morbid Anatomy.* By THEODORE SHENNAN, M. D., F. R. C. S. 18/. (*London: Constable & Company, Limited, 1912.*)

This volume of 496 pages is intended by the author firstly to aid the student of medicine as well as the practitioner to intelligently conduct and report post mortem findings, and to assist the teacher in conveying clear pictures of the naked-eye appearances of diseased organs; secondly to aid and supplement the study of morbid anatomy by a brief discussion of the microscopical and bacteriological aspects of disease in as far as these are necessary for a clear comprehension of the naked eye appearances. Needless to say the field which the author has so well covered is a perilous and difficult one. Practical medicine can hardly be properly taught from text-books and the importance of first-hand information as regards pathological anatomy may not be emphasized too much.

The content of the book is divided into chapters arranged arbitrarily according to the methods employed at the Edinburgh Clinic. The numerous illustrations, 207 in number, compare favorably with those usually found in books of this nature. They are particularly adapted to illustrate gross anatomical changes such as, cardiac valvular stenoses, congenital anomalies and abnormalities of various organs, intestinal conditions as intussusception, ulcers of the intestine, abscesses, gummata, etc., of various organs, hydrocephalus, cerebral hemorrhage, etc., etc., but as usual fail completely in demonstrating more minute changes, such as fatty degeneration and fibroses of the myocardium, acute endocarditis, acute enteritis, the various changes in the nephritic kidney, etc. The two colored plates are good.

The portion of the appendix containing equivalent imperial and metrical measurements of weight, length and capacity, and laboratory methods of more general utility both for preserving tissues in their natural colors and for preparing microscopic sections, will be a handy aid to both student and practitioner laboratory workers. The utility of the portion containing the bibliography is hard to appreciate. It is necessarily incomplete, will rapidly become antedated and is hardly desirable with such catalogues of current literature as that of the Surgeon's General Library and the Index Medicus.

The book is written in a very agreeable style. Methods are clearly elucidated, and while one might take exception to the anatomical classification and description in a few instances, such as the inclusion of syphilitic aortitis simply as a type of endarteritis deformans, etc., the sketchy review of the pathological anatomy is in general very satisfactory.

The book should fill a considerable demand particularly in those schools where the post-mortem material is limited.

*A Clinical Study of Acute Poliomyelitis.* By FRANCIS W. PEABODY, M. D., GEORGE DRAPER, M. D., and A. R. DOCHEZ, M. D. Monographs of the Rockefeller Institute for Medical Research, No. 4. (*New York: 1912.*)

This excellent monograph presents the results of careful investigations on 184 cases of acute poliomyelitis. The various phases of the disease are considered in some detail and the studies are preceded by an interesting history of poliomyelitis. The discussion of the symptomatology is of great interest and value.

This study should be in the hands of every student of infectious diseases who will derive genuine pleasure as well as profit from its reading.

*International Clinics.* Edited by HENRY W. CATTELL, M. D., and collaborators. Vol. III. 22d Series. (*Philadelphia and London: J. B. Lippincott Company, 1912.*)

The variety of lectures in each of these volumes makes them both entertaining and interesting to a large body of readers, for these so-called "Clinics" cover the whole field of medicine. This time we find papers on medical, surgical, ophthalmological and other subjects by such well known men as Solis-Cohen, Arthur Dean Bevan, Roberts, Deaver and others, and without further commendation it may be said that anything written by these men is worth reading.

*Progressive Medicine:* Edited by HOBART AMORY HARE, M. D., etc., and LEIGHTON F. APPLEMAN, M. D., etc. Vol. III. Sept., 1912. (*Philadelphia and New York: Lea & Febiger.*)

The newer work in diseases of the thorax and its viscera, including the heart, lungs and bloodvessels, dermatology and syphilis, obstetrics, and diseases of the nervous system is reviewed in this volume, with the usual careful preparation by the contributing authors, Ewart, Gottheil, Davis and Spiller, all leaders in their special branches. For the busy practitioner *Progressive Medicine* is an important publication.

*Manual of Chemistry.* By W. SIMON, M. D., and DANIEL BASE, Ph. D. Tenth Edition. Thoroughly Revised. Illustrated. (*Philadelphia and New York: Lea & Febiger, 1912.*)

We congratulate Dr. Simon on the appearance of the tenth edition of his *Chemistry*, which has proved itself so eminently satisfactory. The continued success of this work is due largely to the fact that the author keeps it up to date, and the student finds in it all the necessary newer information on the subjects discussed. It is one of the best of students' manuals.

*London Practitioners' Manuals. Anæsthesia and Analgesia.* By J. D. MORTIMER, M. D., etc. $2. (*London: University of London Press, 1911.*)

Nothing new is presented in this book. As the author states in the preface it is a guide to the practitioner, the more scientific details being omitted. Special methods of anæsthesia are touched upon very lightly. The book is concise yet it contains a great many practical suggestions.

The chapters on "Duties and Responsibilities of the Anæsthetist," "Signs Indicating Depth of Anæsthesia," and "Dangers and Difficulties of Anæsthesia," are especially good. The description of the administration of $N_2O$ and ethyl chloride is too meager to be of much value to one who has not already had considerable training. The discussion of percentage mixtures is interesting, especially the conclusion that "By far the most important factor in the safe administration of an anæsthetic is the experience of the administrator."

*Further Researches Into Induced Cell-Reproduction and Cancer.* Illustrated. The John Howard McFadden Researches. $1. (*London: John Murray, 1912.*)

This small volume is made up of four papers by H. C. Ross, J. W. Cropper and E. H. Ross. In these the writers show that "swellings resembling tumors" can be induced in animals "by the action of the same chemical substances which induce individual cell-multiplication." These substances they call "auxetics" and "augmentors." Workers along these and similar lines must need read these papers, which are not intended for the general practitioner but rather for the laboratory worker. The results obtained by Dr. Ross and his associates will have to be confirmed by others before they can be accepted as definite.

*A Manual of Pharmacy for Physicians.* By M. F. DELORME, M. D. Third Edition. Illustrated. $1.25. (*Philadelphia: P. Blakiston's Son & Co., 1912.*)

For a certain class of students this manual may be sufficient, but it is not one to be recommended. It is elementary, and suited to those who have had but very little preliminary education before taking up the study of medicine. It is to be hoped that in a few years there will be no call for such works, which are an evidence of the low standards required by some American medical schools. In so far as it goes it serves its purpose satisfactorily.

*Arteriosclerosis.* By LOUIS M. WARFIELD, M. D. Illustrated. $2.50. (*St. Louis: C. V. Mosby Company, 1912.*)

Since the first appearance of this book four years ago Dr. Warfield has rewritten much of it, and added two important chapters on "The Physical Examination of the Heart and Arteries," and "Arteriosclerosis in Its Relation to Life Insurance." This is a useful work for the general practitioner and it is a satisfaction to note that a second edition was called for, since this is proof that this long little understood condition is now becoming more generally recognized by the doctors at large. They will find this volume really helpful.

*Burdett's Hospitals and Charities—1912: The Year Book of Philanthropy and Hospital Manual.* 10/6. (*London: The Scientific Press, Limited.*)

This volume furnishes all hospital superintendents with a large amount of valuable financial statistics, which, though conditions vary in different countries, are important from a comparative standpoint. In addition to the statistics there is much other general information which is serviceable. To Sir Henry Burdett, the editor, the improvement in the management of English hospitals is largely due, and this publication is the result of his efforts and energy. Unfortunately there is no similar work in this country, the need of one is great, for at present superintendents have no book to turn to where at a glance they can find the information about other hospitals in their own country all carefully compiled and edited.

*The Kallikak Family: A Study on the Heredity of Feeble-Mindedness.* By HENRY HERBERT GODDARD, Ph. D. (*New York: The Macmillan Company, 1912.*)

Through the painstaking and laborious researches of Dr. Goddard and his assistants, this history of the Kallikak family is the most important one that exists as an exposition of the transmission of feeble-mindedness through many generations. What makes it of especial value is that there are two branches of the family both starting from the same ancestor. The one branch of feeble-minded began with the offspring of this ancestor and a feeble-minded girl; the other with the children by marriage of the ancestor with a healthy girl. The two branches never intermarried and can be traced to the present time, so that here it is possible to compare accurately, as has never been done before, the results which followed as a consequence of the union of a healthy man on the one hand with a feeble-minded woman, and on the other with a mentally normal woman. The study is of especial interest as confirming to some extent the Mendelian theory of heredity as applied to man, and also as an exposition of the calamitous results which are likely to follow the uniting of healthy and unhealthy stock. None can read this exposition

without being impressed by the need of state control of the feeble-minded and the benefits that will accrue if more attention is paid both to the physical and mental status of man and woman who contemplate matrimony. This is a most important contribution to the science of eugenics.

*A Text-Book of Gynecology.* By WILLIAM S. GARDNER, M. D. Illustrated. (*New York and London: D. Appleton & Co., 1912.*)

This little volume is an attempt to put the essentials of gynecology within easy reach of the busy medical student. It does not purport to be an exhaustive treatise, but the author's large experience as a teacher and intimate practical knowledge of his subject have enabled him to know just what to omit. He has shown excellent judgment in this respect and has succeeded admirably in the difficult undertaking of producing a brief treatise that is, nevertheless, clear, readable, and sufficiently comprehensive to meet the actual needs of all students except those especially interested in this field of surgery. The pathological side of the subject has received noteworthy attention, the photomicrographs being particularly good. The book will undoubtedly become a general favorite with medical students, for its teaching is eminently sound and practical.

E. H. R.

*The Therapy of Syphilis: Its Development and Present Position.* By DR. PAUL MULZER, Berlin, with a preface by Prof. P. UHLENHUTH, M. D. Translated by A. NEWBOLD. $1.50. (*New York: Rebman Company.*)

This work, though giving some consideration to other methods of treatment, is chiefly concerned with salversan therapy from the point of view of the practitioner. The historical development of the use of arsenic compounds in spirochætal infections is traced in an interesting manner, especial attention being given to the experimental work on which it is based. Various methods of administration are well described. The early results of the clinical use of salversan are given in detail, but as these are only carried to the close of the year 1910, from the present standpoint they are very incomplete. The language in the translation is involved, and in places the meaning is obscure. While the original work at the time of its first appearance served its purpose well, it has already become so old as to have lost much of its usefulness.

P. W. C.

*The Wassermann Reaction: Its Technique and Practical Application in the Diagnosis of Syphilis.* By JOHN W. MARCHILDON, M. D. $1.50. (*St. Louis: C. V. Mosby Company, 1912.*)

This book is evidently written as a laboratory manual for those who have had little or no training in laboratory work. It contains very little that is new or original. It gives in profuse detail the various steps in carrying out the reaction, following for the most part the original method of Wasserman. Recent modifications of the reaction, in particular that of Noguchi, receive scanty consideration.

P. W. C.

*Recent Studies of Syphilis.* A reprint of articles published in the *Interstate Medical Journal.* Second Edition (revised), Sept., 1911. (*St. Louis: Interstate Medical Journal Company.*)

This is an interesting collection of special articles dealing with various phases of the subject. Laboratory diagnostic methods are well described, especially Noguchi's modification of the Wassermann reaction. Of especial interest are the articles dealing with salvarsan therapy. The conservative attitude taken as to the use of the drug and the probability of permanent cure is to be commended. It should be of real use to those engaged in the treatment of syphilis, and especially to the general practitioner.

P. W. C.

*Auto-Intoxication and Disintoxication: An Account of a New Fasting Treatment in Diabetes and Other Chronic Diseases.* By DR. G. GUELPA (Paris). Translated by F. S. ARNOLD, M. B. $1.25. (*New York: Rebman Company, 1912.*)

Not so many years ago it was a common practice for parents to purge their children actively every spring and doubtless this old domestic method of treatment had distinct advantages in many instances. Dr. Guelpa advocates a purge and fasting of two or three days for many patients suffering from chronic affections of one sort or another, and says they derive great benefit from it. This is more than likely and it is probable that many suffer because they do not get their intestines ever properly cleared, that there is always some residue. Occasional fasting such as recommended by the author has its merits also. Dr. Jones, of New York, has long advocated violent purging in severe chronic rheumatic conditions, and many patients have benefited by this method of "disintoxication" as it is named by Dr. Guelpa. In advocacy of his treatment he, however, has such strange theories, that it is impossible to do more than bring to the attention of the profession the value that often lies in an active purge and an absention from all food except liquids for a day or two in various affections.

*The Pituitary Body and Its Disorders.* By HARVEY CUSHING, M. D. Illustrated. $4. (*Philadelphia and London: J. B. Lippincott Company, 1912.*)

Dr. Cushing has devoted the greater part of his time and energies, during the past four years, to the experimental and clinical study of the pituitary body, and this book, in which his experiences are admirably set forth, is of equal interest for the physiologist, the internist, the surgeon, the neurologist and the ophthalmologist.

The book contains many valuable contributions to physiology. Especially interesting in this connection are the observations on the inter-relations of the ductless glands; the influence exerted by the hypophysis on carbohydrate metabolism; and the experiments on feeding and transplanting glands as a therapeutic measure in hypo-pituitarism.

The clinical symptoms of the various pituitary disorders—gigantism, acromegaly, and the symptom complex resulting from a deficient secretion—are discussed in great detail. There are numerous photographs showing the general appearance of patients of each of these groups; also reproductions of the X-rays of the more interesting cases. To many of the case reports are appended a series of carefully made perimetric charts, showing the changes in the form of the visual fields before and after operative therapy.

We regard this book as the most important of the contributions to this subject in English, or indeed in any language. The reading matter is concise and to the point. The illustrations are good. Pituitary disorders are scarcely less frequent than are those of the thyroid; and after reading this book many practitioners will realize that they have had, at one time or another, similar cases under their care.

*A Practical Treatise on Fractures and Dislocations.* By LOUIS A. STIMSON, M. D., etc. Seventh Edition. Revised and Enlarged. Illustrated. (*New York and Philadelphia: Lea & Febiger, 1912.*)

Stimson's work has received such world-wide recognition, and its admirable qualities have been so abundantly recognized by

both teachers and students, that it needs no new word of commendation from us. A few sections on some of the less frequent fractures have been added and new photographs, making the new edition more complete than any of its predecessors. It is a pleasure to note the success of this work, which will long remain one of the best American surgeries.

*The Healthy Baby.* By ROGER H. DENNETT, M. D. $1.00. (*New York: Macmillan Company, 1912.*)

This book has been written to assist inexperienced mothers. It aims especially to describe the "everyday care" required by a healthy child but the common ailments of infancy also receive the attention they merit. The author explains the value of the doctor's advice and discusses the signs of illness which should lead the mother to consult him. The book covers the whole period of infancy, including everything the young mother should know from the time her baby is born until it is two or three years old. The information is accurate; the style is clear and simple. In addition to a full index, marginal headings are provided which make reference easy.

*A Manual of Surgical Treatment.* By SIR W. WATSON CHEYNE, Bart., F. R. S., etc., and F. F. BURGHARD, F. R. C. S. Vol. III. (*Philadelphia and New York: Lea & Febiger, 1912.*)

This is the third volume of the revised edition of Cheyne and Burghard's well known manual. Drs. Legg and Edmunds have done their work of revision thoroughly and they have rewritten many parts. This edition corresponds to the first in being in five volumes, and in this one is contained the treatment of the surgical affections of the joints, the spine, the head, and the face. It is well illustrated, and a student or doctor who can afford to buy this manual will find it profitable, but there are so many surgeries in single volumes and in systems of many volumes that it is most difficult to make a choice, it is an embarrassment of riches. This is an excellent guide, however, and as a surgeon should make himself acquainted with foreign methods as well as those of his own land, he cannot do better than study Cheyne and Burghard.

*Making Good on Private Duty: Practical Hints to Graduate Nurses.* By HARRIET CAMP LOUNSBERY, R. N. $1.00. (*Philadelphia and London: J. B. Lippincott Company, 1912.*)

These hints have already appeared in large part in one or two of the nursing journals, and it was hardly worth while to republish them in book form. If a nurse, before she graduated, had not been taught these primary principles, she certainly would not be fit to commence her career as a private nurse. There are one or two brief chapters which may prove helpful to any nurse, but those on conduct are so elementary as to be almost laughable; and "Making Good on Private Duty" is not essential to a nurse's stock of books on her own profession.

*A Clinical Manual of the Malformations and Congenital Diseases of the Fœtus.* By PROFESSOR DR. R. BIRNBAUM. Translated and Annotated by G. BLACKER, M. D., etc. (*Philadelphia: P. Blakiston's Son & Co., 1912.*)

This work is one of large interest to the physician and surgeon as well as the obstetrician, who sees these malformations more often than any other class of practitioner. Dr. Birnbaum has not attempted to write a complete treatise on the subject since this would have necessitated a much larger work, but he has described those malformations which are of more general interest to the surgeon, and on the other hand from the medical point of view has omitted such diseases as congenital syphilis, congenital infectious diseases, and asphyxia neonatorum, as all these are commonly fully described in the text-books on children's diseases. For the general practitioner he has compiled a large amount of valuable information which is only to be found scattered throughout the literature and has produced a work which will be of real service to a large body of doctors. There is none other in English which can be compared with it as a practical discussion of the subject, though there is an immense literature on teratology.

*The Practitioner's Visiting List for 1913.* A pocket-sized book containing memoranda and data important for every physician, and ruled blanks for recording every detail of practice. The Weekly, Monthly and 30-Patient Perpetual contain 32 pages of data and 160 pages of classified blanks. The 60-Patient Perpetual consists of 256 pages of blanks alone. Each in one wallet-shaped book, bound in flexible leather, with flap and pocket, pencil with rubber, and calendar for two years. Price by mail, postpaid, to any address, $1.25. Thumb-letter index, 25 cents extra. (*Philadelphia and New York: Lea & Febiger, Publishers.*)

The above description, taken from the publishers' circular, describes the pocket book. Many such pocket books are annually produced, all very similar in character, and we are glad to call attention to them, as they evidently are serviceable to a large body of practitioners.

*Lehrbuch der Augenheilkunde in der Form Klinischer Besprechungen.* Von DR. PAUL RÖMER. Illustrirt. Mks. 22.50. (*Berlin u. Wien: Urban & Schwarzenberg. New York: Rebman Company, 1910.*)

This would be found a most excellent text-book to recommend to students on the eye were it not for the fact that the fact that the subject matter is presented in the form of clinical lectures which of necessity requires excessive verbiage. The author describes the various diseases of the eye with wonderful preciseness and he lays particular stress on a correct understanding of the anatomical and pathological changes which the diseased eyes undergo as a basis for rational therapeusis. Clear mental pictures are thus given the reader, and there are reasons and explanations in detail for all the clinical factors involved. Without further criticism, for we can only say that it is an excellent text-book, and may be studied and read with profit, we wish to call particular attention to the very exhaustive consideration of the lens of the eye. This subject matter which comprises Part 4 of the present volume is the most complete and masterly monograph on the "Lens" which we know of, and the author shows therein marvelous skill in presenting the most recent work of others, enriched with observations and explanations of his own which are most satisfactory. For instance the nutrition of the lens has long been considered a matter of speculation, but the present author shows that the recent work of Rissling, Leber, Hess, and himself has put so many demonstrable facts at our disposal as to render this part of the eye almost independent of fancy.

In no part of the present work is the subject matter compressed and yet one would not go far wrong should he consider every page as worthy of his close attention and memory.

B. B. B., JR.

*Text-Book of Ophthalmology in the Form of Clinical Lectures.* By DR. PAUL RÖMER. Translated by DR. MATTHIAS LANCKTON FOSTER. Illustrated. Vol. I. (*New York: Rebman Company, 1912.*)

This is merely the translation in part of the work reviewed above. The work of the translator has been done conscientiously and well, and it is fortunate that Römer's masterly work can be had by those who only read English.

*Man's Redemption of Man: A Lay Sermon.* By WILLIAM OSLER. 50cts. (*New York: Paul B. Hoeber, 1912.*)

In neat pocket form it is a pleasure to welcome anew this delightful essay, already familiar to all admirers of the author. It is an essay all young students of medicine should read and ponder over, and the more familiar it becomes to the profession, the higher will grow its aspirations and ideals.

*Oxford Medical Publications: Tuberculin Treatment.* By CLIVE RIVIERE, M. D., and EGBERT MORELAND, M. D. $2.00. (*London: Henry Frowde and Hodder & Stoughton, 1912.*)

This volume, without entering deeply into the scientific basis and data of tuberculin therapy, will yet serve well as a practical hand book for those wishing to acquire a technique. The diagrams, though often based on much that is assumption, help to point many a tuberculin moral. Worthy of note is the emphasis laid upon the dual anti-body system that is apparently concerned with tuberculin hypersensitiveness. Taking time entirely too much by the forelock, is the assignment of a large section of the book to the treatment of certain forms of tuberculosis by the method of persistently small doses. Not that such treatment may not be gracefully advocated, but the advocacy is too strong for our task when it supports itself upon a classification of tuberculous diseases framed as much to fit the occasion as with thought to its ulterior justification. In other respects, the book is eminently clear and sane, and is to be welcomed as a contribution to a subject which is being more and more discussed. S. W.

1. *A Text-Book of Obstetrics: Including Related Gynecologic Operations.* By BARTON COOKE HIRST, M. D. Seventh Revised Edition. Illustrated. $.500. *1912.*
2. *A Text-Book on the Practice of Gynecology.* For Practitioners and Students. By W. EASTERLY ASHTON, M. D. Fifth Edition, Thoroughly Revised. Illustrated. $6.50. *1912.*
3. *A Text-Book Upon the Pathogenic Bacteria and Protozoa.* For Students of Medicine and Physicians. By JOSEPH MCFARLAND, M. D. Seventh Edition, Thoroughly Revised. Illustrated. $3.50. *1912.*
4. *Diseases of the Stomach, Intestines and Pancreas.* By ROBERT COLEMAN KEMP, M. D. Second Edition, Revised and Enlarged. Illustrated. $6.50. *1912.*

From the publishers, W. B. Saunders Company, we have received the last editions of the four above-named works. The fact that there is a constant demand by the profession for these books indicates how well the authors have met the needs of students and practitioners. All the volumes show some alterations which add to their usefulness. It is a satisfaction to note that there is a call for these reliable and well written books. Both authors and publishers are to be congratulated on their success.

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2. *Consumption in General Practice.* By H. Hyslop Thomson, M. D., D. P. H. 1912. 8vo. 335 pages.
3. *Surgery of the Rectum for Practitioners.* By Sir Frederick Wallis, M. B., B. C. Cantab., F. R. C. S. 1912. 8vo. 355 pages.
4. *The Practitioner's Encyclopædia of Medicine and Surgery.* In all their Branches. Edited by J. Keogh Murphy, M. C. (Cantab.), F. R. C. S. 1912. 4to. 1423 pages.

*The Mechanistic Conception of Life.* Biological Essays. By Jacques Loeb, M. D., Ph. D., Sc. D. 1912. 8vo. 232 pages. The University of Chicago Press, Chicago, Illinois.

*Practical Anatomy.* An Exposition of the Facts of Gross Anatomy from the Topographical Standpoint and a Guide to the Dissection of the Human Body. By John C. Heisler, M. D. With 366 illustrations, of which 225 are in color. By E. F. Faber. [1912.] 8vo. 790 pages. J. B. Lippincott Company, Philadelphia and London.

*Pharmacology and Therapeutics.* By Horatio C. Wood, Jr., M. D. 1912. 8vo. 429 pages. J. B. Lippincott Company, Philadelphia and London.

*The Pituitary Body and Its Disorders.* Clinical States Produced by Disorders of the Hypophysis Cerebri. By Harvey Cushing, M. D. An Amplification of the Harvey Lecture for December, 1910. 319 Illustrations. 1912. 8vo. 341 pages. J. B. Lippincott Company, Philadelphia and London.

*A Text-Book of Obstetrics.* By Barton Cooke Hirst, M. D. Seventh edition, revised and enlarged with 895 illustrations, 53 of them in colors. 1912. 8°. 1013 pages. W. B. Saunders Company, Philadelphia and London.

*A Text-Book on the Practice of Gynecology.* By William Easterly Ashton, M. D., LL. D. With ten hundred and fifty new line drawings illustrating the text by John V. Alteneder. Fifth edition, thoroughly revised. 1912. 8°. 1100 pages. W. B. Saunders Company, Philadelphia and London.

*Arteriosclerosis, Etiology, Pathology, Diagnosis, Prognosis, Prophylaxis, and Treatment.* With a special chapter on Blood Pressure. By Louis M. Warfield, A. B., M. D. With an introduction. By W. S. Thayer, M. D. Illustrated with twenty-eight engravings. 1912. 8vo. 220 pages. C. V. Mosby Company, St. Louis.

*Principles of Microbiology.* A Treatise on Bacteria, Fungi and Protozoa Pathogenic for Domesticated Animals. By Veranus Alva Moore, B. S., M. D., V. M. D. One hundred and one illustrations. 1912. 8vo. 506 pages. Carpenter and Company, Ithaca, New York.

*A Text-Book of Practical Therapeutics.* With Especial Reference to the Application of Remedial Measures to Disease and their Employment upon a Rational Basis. By Hobart Amory Hare, M. D., B. Sc. Fourteenth edition, enlarged, thoroughly revised, and largely rewritten. Illustrated with 131 engravings and 8 plates. 1912. 8vo. 984 pages. Lea & Febiger, Philadelphia and New York.

*Pharmacology: Action and Uses of Drugs.* By Maurice Vejux Tyrode, M. D. Second edition. 1912. 8vo. 288 pages. P. Blakiston's Son & Co., Philadelphia.

*Philadelphia General Hospital Reports.* Volume VIII. 1910. Edited by David Riesman, M. D. 1911. 8vo. 367 pages. Dunlap Printing Co., Philadelphia.

*Fifth Scientific Report on the Investigations of the Imperial Cancer Research Fund.* Under the Direction of the Royal College of Physicians of London and the Royal College of Surgeons of England. By Dr. E. F. Bashford. 1912. 8vo. 94 pages. Taylor and Francis, London.

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**THE JOHNS HOPKINS HOSPITAL BULLETIN.**

It is issued monthly. Volume XXIV begins with January, 1913. The subscription price is $2.00 per year. (Foreign postage, 50 cents.) Price of cloth-bound volumes, $2.50 each.

A complete index to Vols. I-XVI of the Bulletin has been issued. Price, 50 cents, bound in cloth.

Orders should be addressed to THE JOHNS HOPKINS PRESS, BALTIMORE, MD.

*The Johns Hopkins Hospital Bulletins are issued monthly. They are printed by the LORD BALTIMORE PRESS, Baltimore. Subscriptions, $2.00 a year (foreign postage, 50 cents), may be addressed to the publishers, THE JOHNS HOPKINS PRESS, BALTIMORE; single copies will be sent by mail for twenty-five cents each. Single copies may also be procured from the BALTIMORE NEWS CO., Baltimore.*